# R407C Air Cooled Condensing Unit

Models: M4LC 010B/BR
M4LC 015B/BR
M4LC 020B/BR
M4LC 025B/BR
M4LC 030C/CR
M4LC 040C/CR
M4LC 050C/CR

**IMPORTANT**

This air conditioners use new refrigerant R407C. Please refer to “Special Precautions” when dealing with refrigerant R407C unit.

CE

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ISO 9002

McQuay®
Air Conditioning

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**Note:** Installation and maintenance are to be performed only by qualified personnel who are familiar with local codes and regulations, and experienced with this type of equipment.

**Caution:** Sharp edges and coil surfaces are a potential injury hazard. Avoid contact with them.

**Warning:** Moving machinery and electrical power hazards. May cause severe personal injury or death. Disconnect and lock off power before servicing equipment.

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# Introduction To Refrigerant R407C

## Environmental friendly

The Montreal Protocol regulation calls for the phase-out of HCFCs by the year 2030 to prevent the ozone layer from further depletion. R407C is an environment friendly refrigerant to replace R22. The operating characteristics of R407C system bears close similarity to that of R22. R407C thermophysical properties such as pressure-temperature behavior, and heat-transfer characteristic are somewhat similar to the properties of R22.

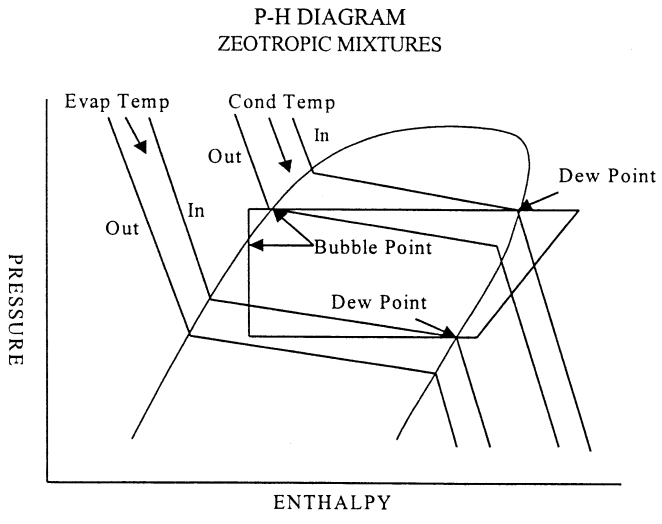
| Physical Property | R407C | R22 |
|---|---|---|
| Molecular Wt (g/mol) | 86.2 | 86.5 |
| Vapor Density (kg/m$^3$) | 42.0 | 44.2 |
| Liquid Density (kg/m$^3$) | 1134 | 1195 |
| Boiling Point (°C) | -37.1 to -44.3 | -40.8 |
| Latent Heat Vap (kJ/kg) | 245 | 234 |
| Ozone Depletion Potential | 0.00 | 0.05 |
| Global Warming Potential | 1600 | 1700 |

## R407C characteristics

R407C is a ternary mixture of R32, R125, and R134a with weight composition of 23%, 25% and 52% respectively. These three components have different vapor pressure and boiling points. R407C liquid and vapor components have different compositions when the fluid evaporates or condenses. This gives rise to a temperature glide where the bubble point and dew point are of different temperatures. The effect of glide in heat exchangers is that as the refrigerant mixture flows through the tubing at constant pressure, the evaporating temperature will change as the composition of the liquid and vapor phases change. Typically, the glide for R407C is about 5°C to 10°C. The extend of temperature glide actually varies with the pressure and composition of components present in the mixture during the leak.

The main concerns for R407C is its zeotropic nature. When leak occurs and only vapor leaks out, the composition of the refrigerant mixture left in the system will change. Especially, when the system is idle, R32 being the lightest component will leak out more than the other components. What remains in the system will be of different composition. If the leaked system is subsequently top-up with R407C, the mixture in the system will varies from the original composition percentage ratio.
This composition shift will slightly affect the system performance. However, study has shown that after a series of repeated leaks and top-ups, the system capacity drops up to 6%.

Another concern for R407C system is the lubricant used for its compressor. Like all HFC refrigerants, R407C uses polyol ester oil (POE) as its lubricant. This hydroscopic oil is prone to moisture contamination. Extra precaution must be taken not to expose the R407C system too long to moist air; as the oil will soak up the moisture into the system.



# Specifications

## Cooling Only

| MODEL | | | OUTDOOR UNIT | | M4LC 010B | M4LC 015B | M4LC 020B | M4LC 025B | M4LC 030C | M4LC 040C | M4LC 050C |
|---|---|---|---|---|---|---|---|---|---|---|---|
| NOMINAL | | | | kcal/h | 2,268 | 2,772 | 4,612 | 5,292 | 7,560 | 9,576 | 12,600 |
| COOLING | | | | W | 2,637 | 3,223 | 5,363 | 6,155 | 8,792 | 11,134 | 14,650 |
| CAPACITY | | | | Btu/h | 9,000 | 11,000 | 18,300 | 21,000 | 30,000 | 38,000 | 50,000 |
| REFRIGERANT / CONTROL | | | | | R407C / CAPILLARY TUBE (OUTDOOR) | | | | R407C / CAPILLARY TUBE (OUTDOOR) + (TXV) | | |
| OUTDOOR UNIT | POWER SOURCE | | | V/Ph/Hz | 240 / 1 / 50 | | | | | 415 / 3 / 50 | |
| | COMP | COMPRESSOR TYPE | | | ROTARY HERMATIC | | | | SCROLL | | |
| | | CAPACITOR | | μF | 30 | 30 | 45 | 50 | 50 | - | - |
| | | RATED RUNNING CURRENT | | A | 4.00 | 6.20 | 9.91 | 12.50 | 11.40 | 6.30 | 8.20 |
| | | RATED INPUT POWER | | W | 900 | 1,350 | 2,112 | 2,660 | 2,560 | 3,741 | 4,328 |
| | | PROTECTION DEVICE | | | OVERLOAD PROTECTION | | | | | | |
| | FAN | FAN TYPE / DRIVE | | | PROPELLER / DIRECT | | | | | | |
| | | BLADE MATERIAL | | | GLASS REINFORCED ACRLY STYRENE RESIN | | | | | | |
| | | DIAMETER | | mm/in | 335 / 14 | | 406 / 16 | | 610 / 24 | | |
| | | RATED RUNNING CURRENT | | A | 0.28 | | 0.56 | | 1.09 | | |
| | | RATED INPUT POWER | | W | 62 | | 133 | | 241 | | |
| | COIL | TUBE | MATERIAL | | SEAMLESS COPPER | | | | | | |
| | | | DIAMETER | mm/in | 9.52 / 3/8 | | | | | | |
| | | | THICKNESS | mm/in | 0.36 / 0.014 | | | | | | |
| | | FIN | MATERIAL | | ALUMINIUM (SLIT FIN TYPE) | | | | | | |
| | | | THICKNESS | mm/in | 0.127 / 0.005 | | | | | | |
| | | | ROW | | 1 | | 2 | | 1 | 2 | |
| | | | FIN PER INCH | | 19 | | 14 | | 16 | 16 | |
| | | FACE AREA | | $m^2/ft^2$ | 0.32 / 3.50 | | 0.51 / 5.53 | | 0.87 / 9.33 | | |
| | DIMENSION | | HEIGHT | mm/in | 494 / 19.4 | | 646 / 25.4 | | 850 / 33.5 | | |
| | | | WIDTH | mm/in | 740 / 29.1 | | 840 / 33.1 | | 1,030 / 40.6 | | |
| | | | DEPTH | mm/in | 270 / 10.6 | | 330 / 13.0 | | 400 / 15.7 | | |
| | WEIGHT | | | kg | 31.0 | 34.0 | 57.0 | 58.0 | 92.5 | 98.9 | 115 |
| | CASING | | MATERIAL | | GALVANIZED MILD STEEL | | | | | | |
| | | | THICKNESS | mm/in | 0.8 / 0.031 | | | | 1.0 ~ 2.3 (0.0393 - 0.0905) | | |
| | | | FINISHING | | EPOXY POLYESTER POWDER | | | | | | |
| | PIPE | TYPE | | | FLARE VALVE / AEROQUIP | | | | FLARE VALVE | | |
| | | SIZE | LIQUID | mm/in | 6.35 / 1/4 | 6.35 / 1/4 | 6.35 / 1/4 | 9.52 / 3/8 | 9.52 / 3/8 | 9.52 / 3/8 | 9.52 / 3/8 |
| | | | GAS | mm/in | 9.52 / 3/8 | 12.70 / 1/2 | 15.88 / 5/8 | 15.88 / 5/8 | 15.88 / 5/8 | 19.05 / 3/4 | 19.05 / 3/4 |
| | PACKING DIMENSION | | HEIGHT | mm/in | 558 / 22.0 | | 710 / 28.0 | | 1,000 / 39.4 | | |
| | | | WIDTH | mm/in | 851 / 33.5 | | 957 / 37.7 | | 1,200 / 47.2 | | |
| | | | DEPTH | mm/in | 401 / 15.8 | | 461 / 18.1 | | 560 / 22.0 | | |
| | REFRIGERANT CHARGE | | | kg | 0.78 | 0.93 | 1.65 | 1.65 | 1.90 | 3.13 | 3.15 |

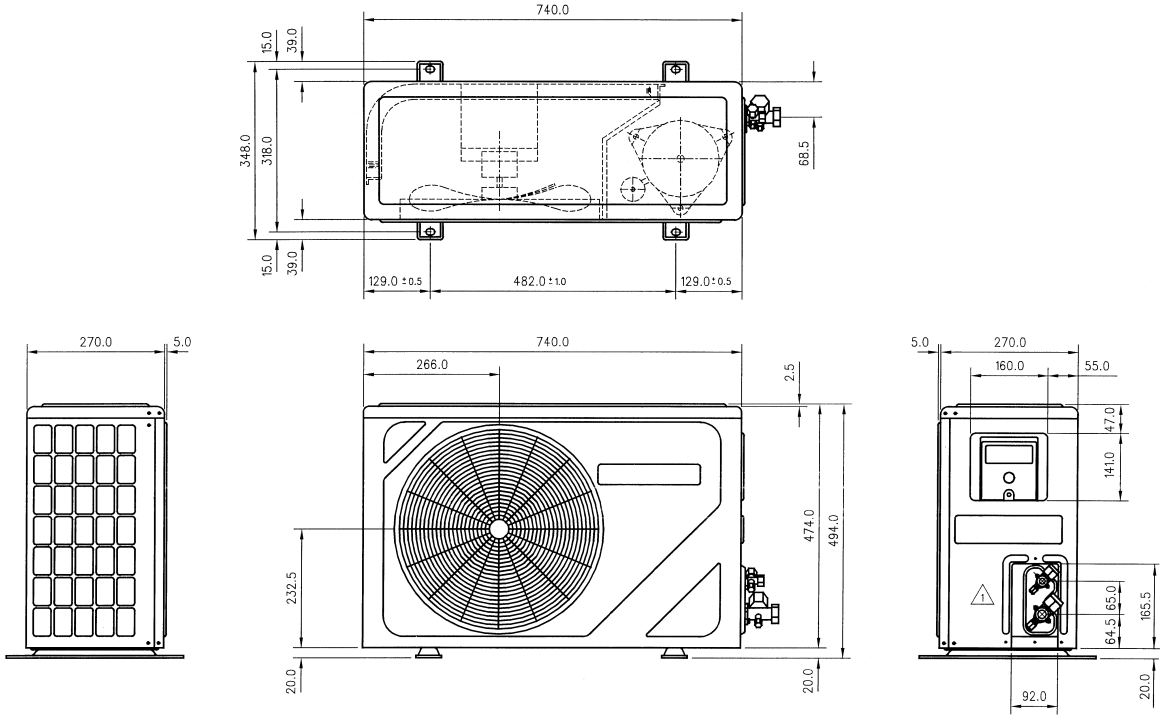
## Heat pump

| MODEL | | | OUTDOOR UNIT | | M4LC 010BR | M4LC 015BR | M4LC 020BR | M4LC 025BR | M4LC 030CR | M4LC 040CR | M4LC 050CR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| NOMINAL | | | | kcal/h | 2,268 | 2,772 | 4,536 | 5,170 | 7,310 | 9,830 | 12,100 |
| COOLING | | | | W | 2,637 | 3,223 | 5,274 | 6,008 | 8,499 | 11,430 | 14,068 |
| CAPACITY | | | | Btu/h | 9,000 | 11,000 | 18,000 | 20,500 | 29,000 | 39,000 | 48,000 |
| NOMINAL | | | | kcal/h | 2,394 | 3,150 | 4,790 | 6,050 | 7,812 | 10,332 | 12,600 |
| HEATING | | | | W | 2,784 | 3,663 | 5,569 | 7,034 | 9,083 | 12,013 | 14,654 |
| CAPACITY | | | | Btu/h | 9,500 | 12,500 | 19,000 | 24,000 | 31,000 | 41,000 | 50,000 |
| REFRIGERANT / CONTROL | | | | | R407C / CAPILLARY TUBE (OUTDOOR) | | | | R407C / CAPILLARY TUBE (OUTDOOR) + (TXV) | | |
| OUTDOOR UNIT | POWER SOURCE | | | V/Ph/Hz | 240 / 1 / 50 | | | | | 415 / 3 / 50 | |
| | COMP | COMPRESSOR TYPE | | | ROTARY HERMATIC | | | | SCROLL | | |
| | | CAPACITOR | | μF | 30 | 30 | 45 | 50 | 50 | NIL | NIL |
| | | RATED RUNNING CURRENT (COOLING) | | A | 4.00 | 6.20 | 9.50 | 12.60 | 11.50 | 6.20 | 8.80 |
| | | RATED RUNNING CURRENT (HEATING) | | A | 3.30 | 5.70 | 10.10 | 12.50 | 11.40 | 5.90 | 7.80 |
| | | RATED INPUT POWER (COOLING) | | W | 900 | 1,350 | 2,002 | 2,571 | 2,424 | 3,565 | 4,615 |
| | | RATED INPUT POWER (HEATING) | | W | 750 | 1,200 | 2,096 | 2,549 | 2,407 | 3,280 | 3,734 |
| | | PROTECTION DEVICE | | | OVERLOAD PROTECTION | | | | | | |
| | FAN | FAN TYPE / DRIVE | | | PROPELLER / DIRECT | | | | | | |
| | | BLADE MATERIAL | | | GLASS REINFORCED ACRLY STYRENE RESIN | | | | | | |
| | | DIAMETER | | mm/in | 335 / 14 | | 406 / 16 | | 610 / 24 | | |
| | | RATED RUNNING CURRENT | | A | 0.28 | | 0.56 | | 1.09 | | |
| | | RATED INPUT POWER | | W | 62 | | 133 | | 241 | | |
| | COIL | TUBE | MATERIAL | | SEAMLESS COPPER | | | | | | |
| | | | DIAMETER | mm/in | 9.52 / 3/8 | | | | | | |
| | | | THICKNESS | mm/in | 0.36 / 0.014 | | | | | | |
| | | FIN | MATERIAL | | ALUMINIUM (SLIT FIN TYPE) | | | | | | |
| | | | THICKNESS | mm/in | 0.127 / 0.005 | | | | | | |
| | | | ROW | | 1 | | 2 | | 2 | | |
| | | | FIN PER INCH | | 19 | | 14 | | 16 | | |
| | | FACE AREA | | $m^2/ft^2$ | 0.32 / 3.50 | | 0.51 / 5.53 | | 0.56 / 6.00 | 0.77 / 8.29 | |
| | DIMENSION | | HEIGHT | mm/in | 494 / 19.4 | | 646 / 25.4 | | 772 / 30.40 | 960 / 37.80 | |
| | | | WIDTH | mm/in | 740 / 29.1 | | 840 / 33.1 | | 991 / 39.00 | 1,095 / 43.10 | |
| | | | DEPTH | mm/in | 270 / 10.6 | | 330 / 13.0 | | 400 / 15.75 | 437 / 17.20 | |
| | WEIGHT | | | kg | 31.0 | 34.0 | 57.0 | 58.0 | 92.5 | 98.9 | 115.0 |
| | CASING | | MATERIAL | | GALVANIZED MILD STEEL | | | | | | |
| | | | THICKNESS | mm/in | 0.8 / 0.031 | | | | 1.0 - 2.3 ( 0.0393 - 0.0905 ) | | |
| | | | FINISHING | | EPOXY POLYESTER POWDER | | | | | | |
| | PIPE | TYPE | | | FLARE VALVE / AEROQUIP | | | | FLARE VALVE | | |
| | | SIZE | LIQUID | mm/in | 6.35 / 1/4 | 6.35 / 1/4 | 6.35 / 1/4 | 9.52 / 3/8 | 9.52 / 3/8 | 9.52 / 3/8 | 9.52 / 3/8 |
| | | | GAS | mm/in | 9.52 / 3/8 | 12.70 / 1/2 | 15.88 / 5/8 | 15.88 / 5/8 | 15.88 / 5/8 | 19.05 / 3/4 | 19.05 / 3/4 |
| | PACKING DIMENSION | | HEIGHT | mm/in | 558 / 22.0 | | 710 / 28.0 | | 1,016 / 40.0 | | |
| | | | WIDTH | mm/in | 851 / 33.5 | | 957 / 37.7 | | 1,207 / 47.5 | | |
| | | | DEPTH | mm/in | 401 / 15.8 | | 461 / 18.1 | | 559 / 22.0 | | |
| | REFRIGERANT CHARGE | | | kg | 0.98 | 1.00 | 1.70 | 1.65 | 2.35 | 3.10 | 3.35 |

*1) ALL SPECIFICATIONS ARE SUBJECTED TO CHANGE BY THE MANUFACTURER WITHOUT PRIOR NOTICE.*
*2) ALL UNITS ARE BEING TESTED AND COMPLY TO ARI 210/240-89.*
*3) NOMINAL COOLING AND HEATING CAPACITY ARE BASED ON THE CONDITIONS BELOW :*
*a) COOLING – 26.7°C DB / 19.4°C WB INDOOR AND 35°C DB OUTDOOR.*
*b) HEATING – 21.1°C DB / 15.6°C WB INDOOR AND 8.3°C DB / 6.1°C WB OUTDOOR.*

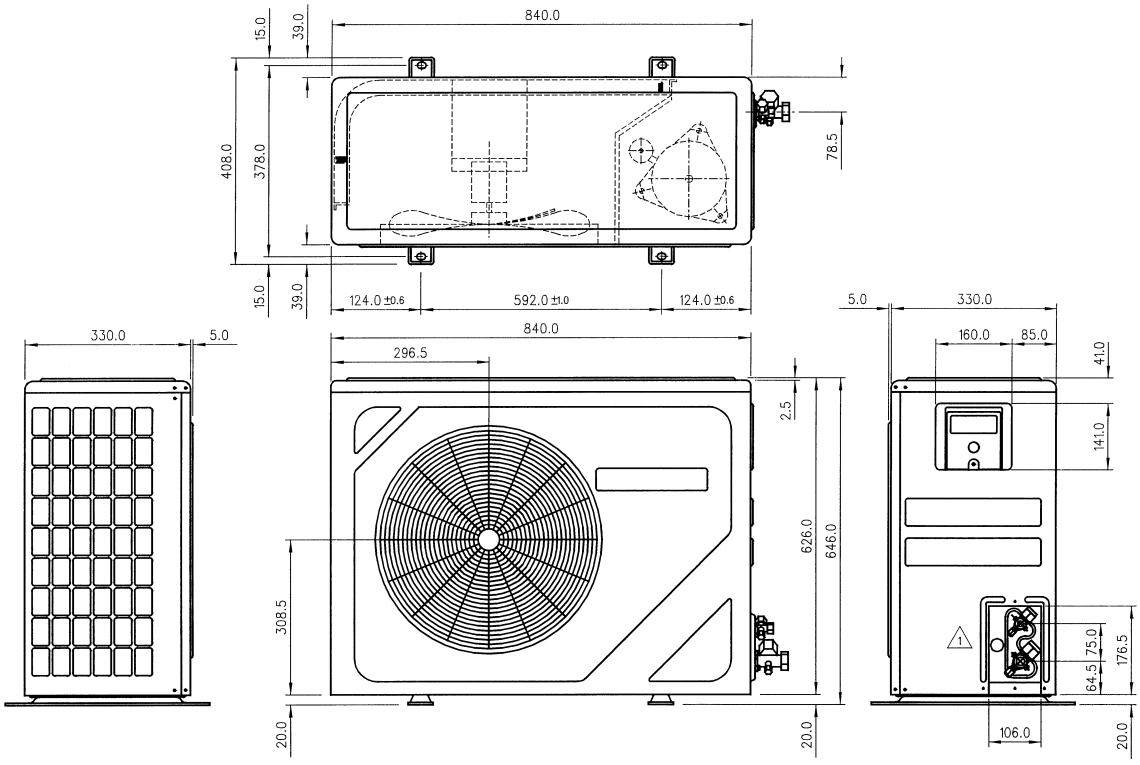
# Outlines And Dimensions

### Model : M4LC 010B/015B, 010BR/015BR



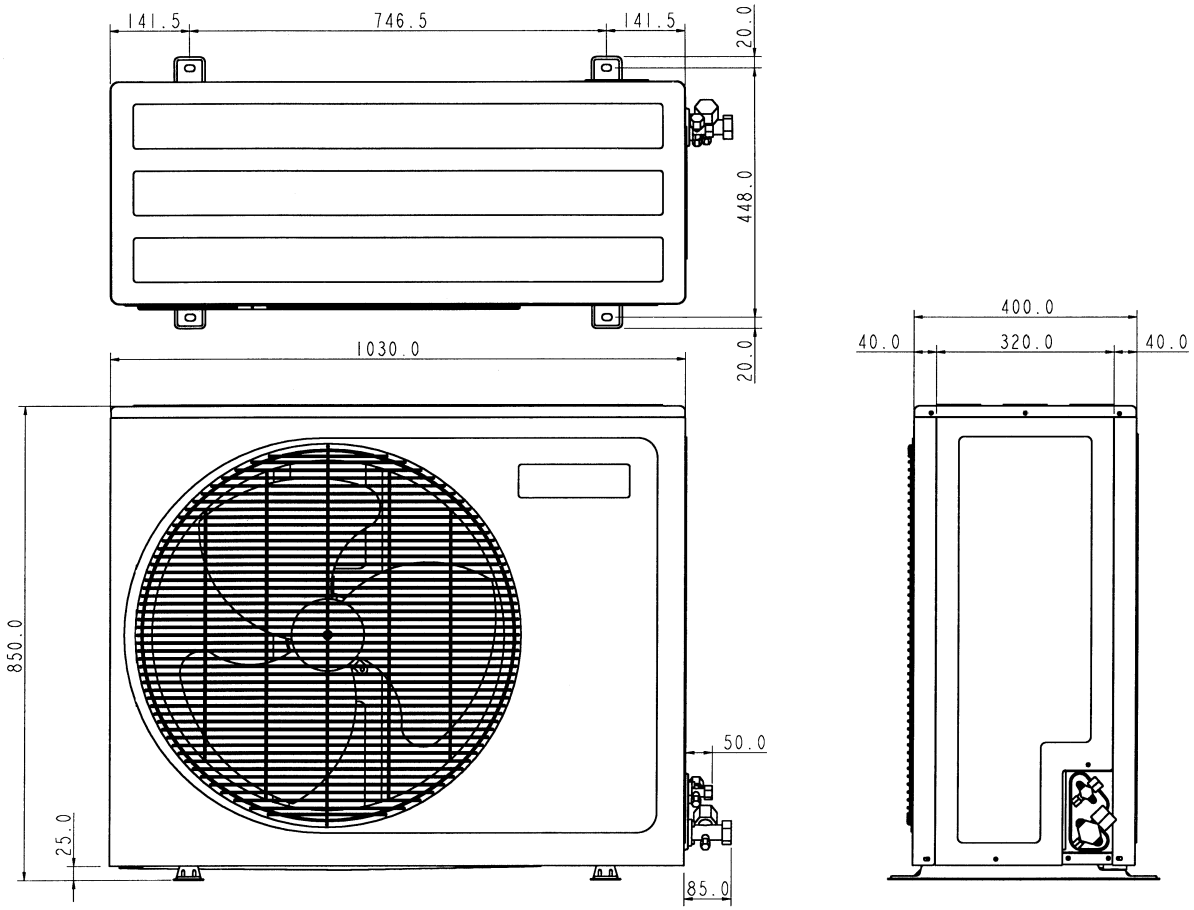

All dimensions in mm

### Model : M4LC 030/040/050C, M4LC 030/040/050CR




All dimensions in mm

## MODEL : M4LC 030/040/050C, M4LC 030/040/050CR

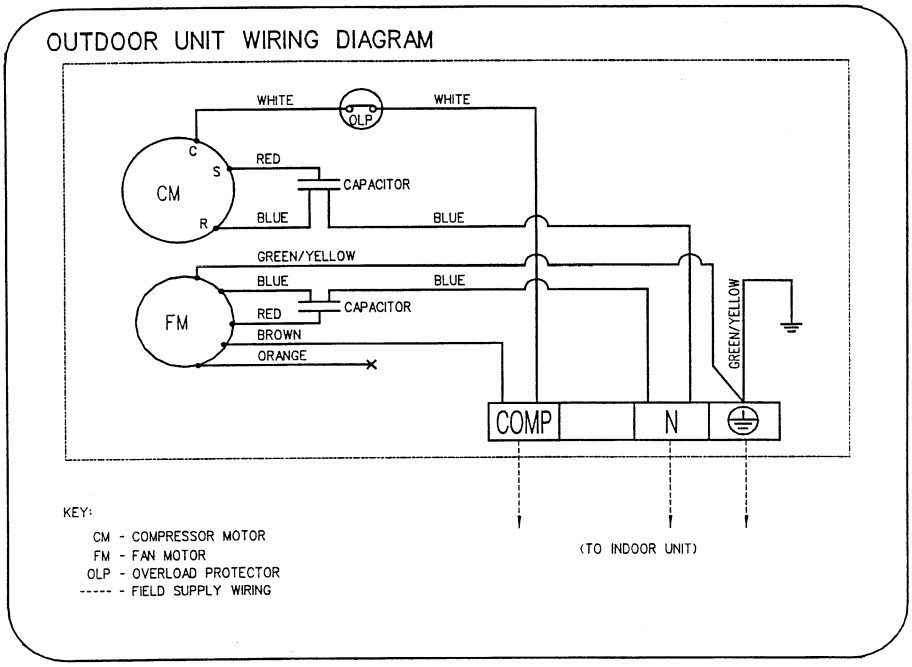



All dimensions in mm

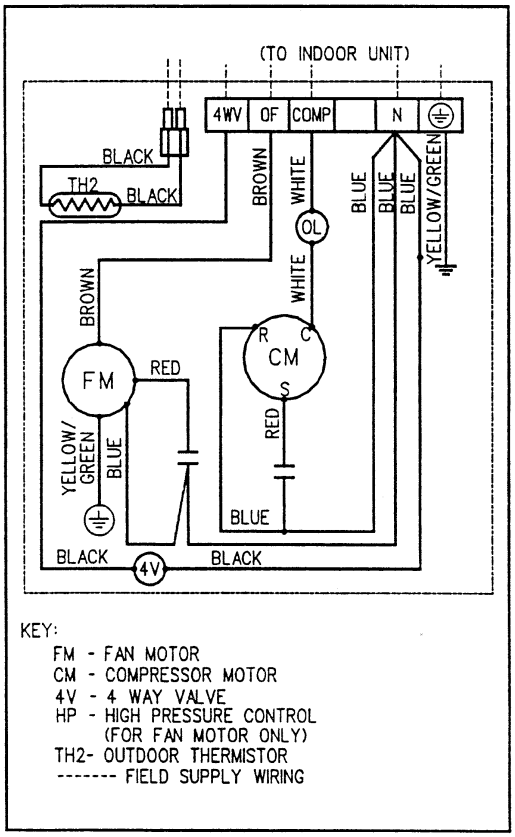
**Caution** Sharp edges and coil surfaces may cause injury. Wear protective gloves when handling the unit.

# Wiring Diagrams

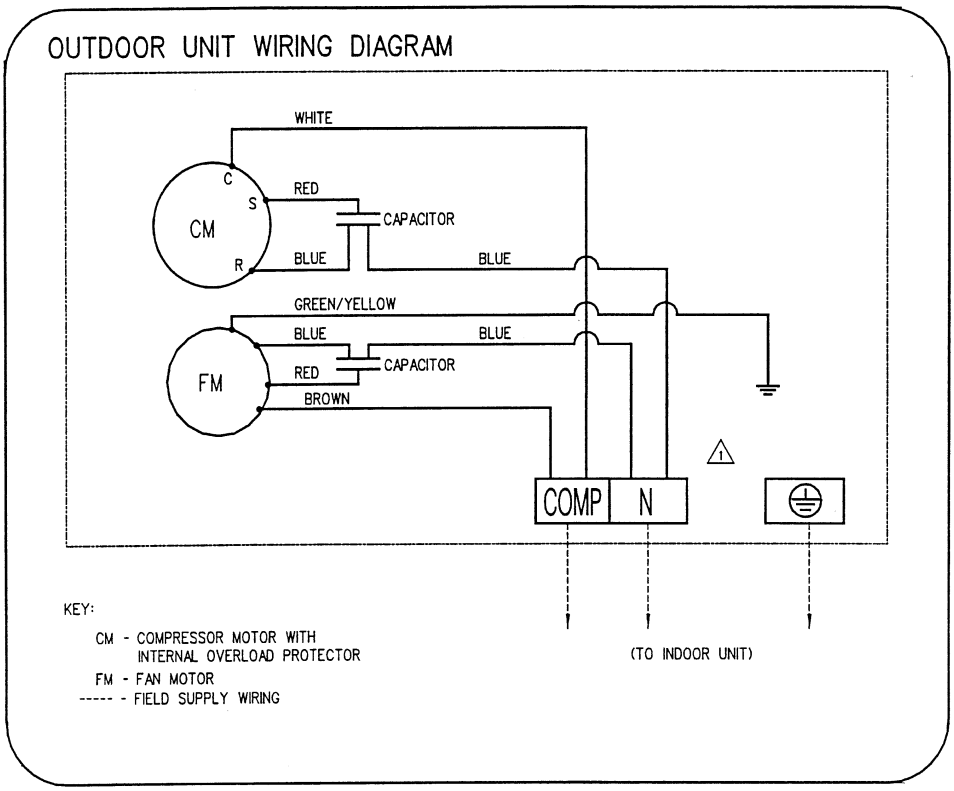
## Model : M4LC 010B/015B



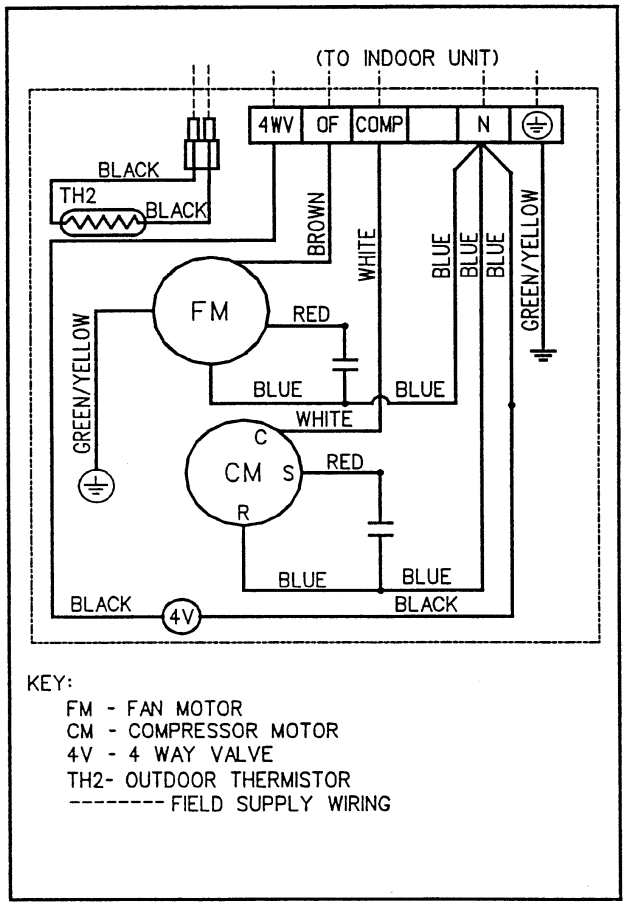

## Model : M4LC 010BR/015BR



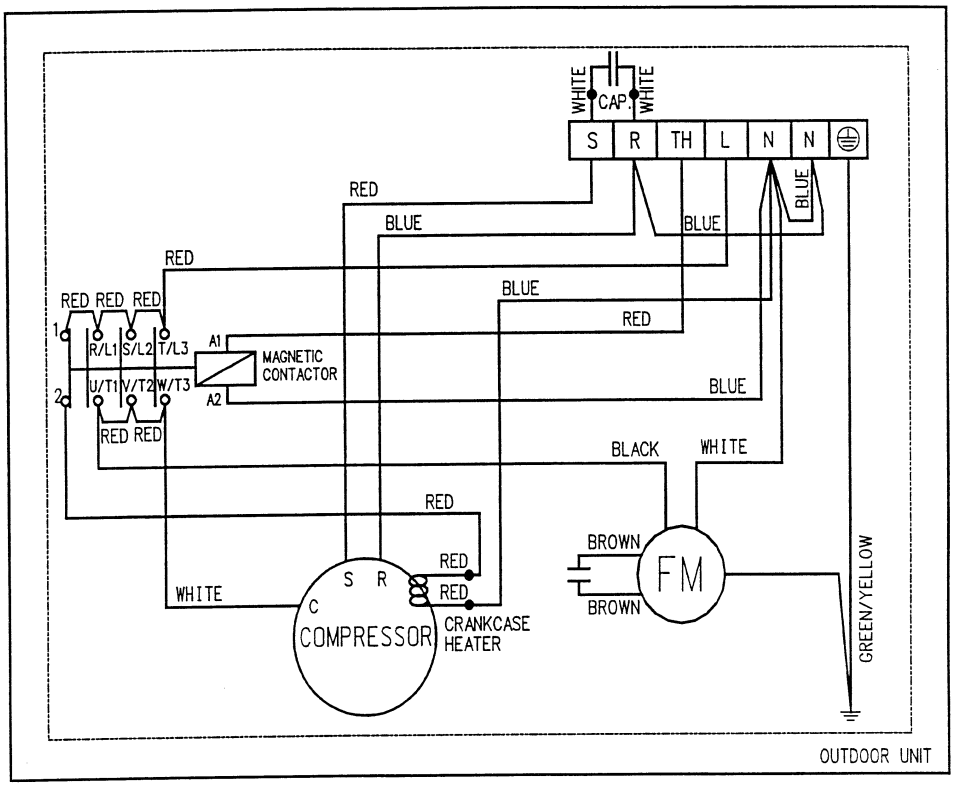
## Model : M4LC 020B/025B



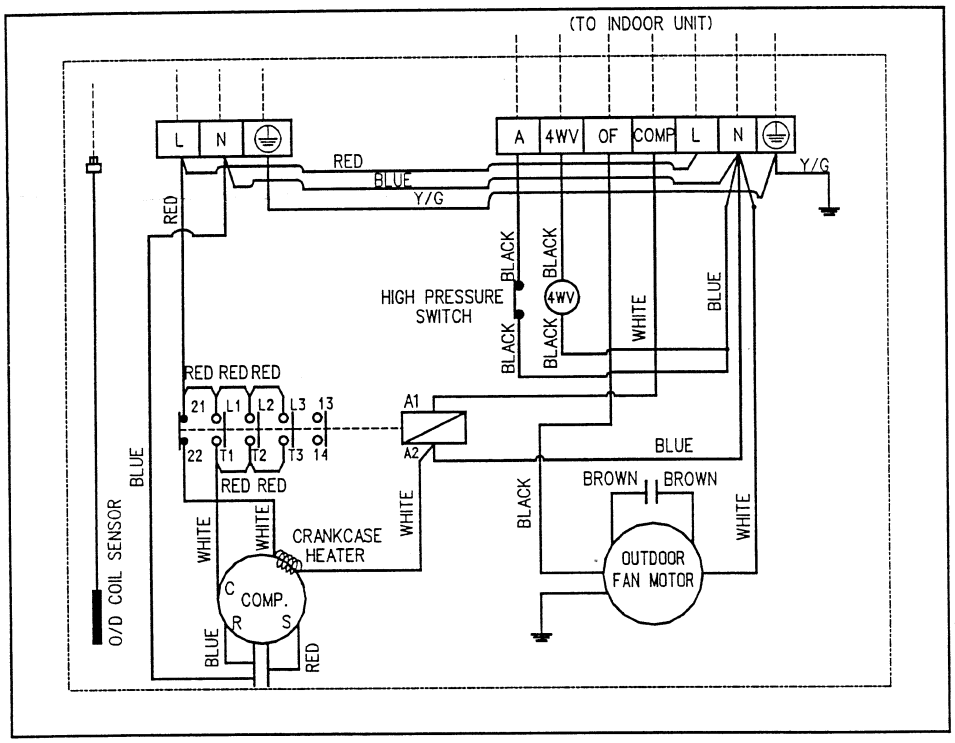

## Model : M4LC 020BR/025BR



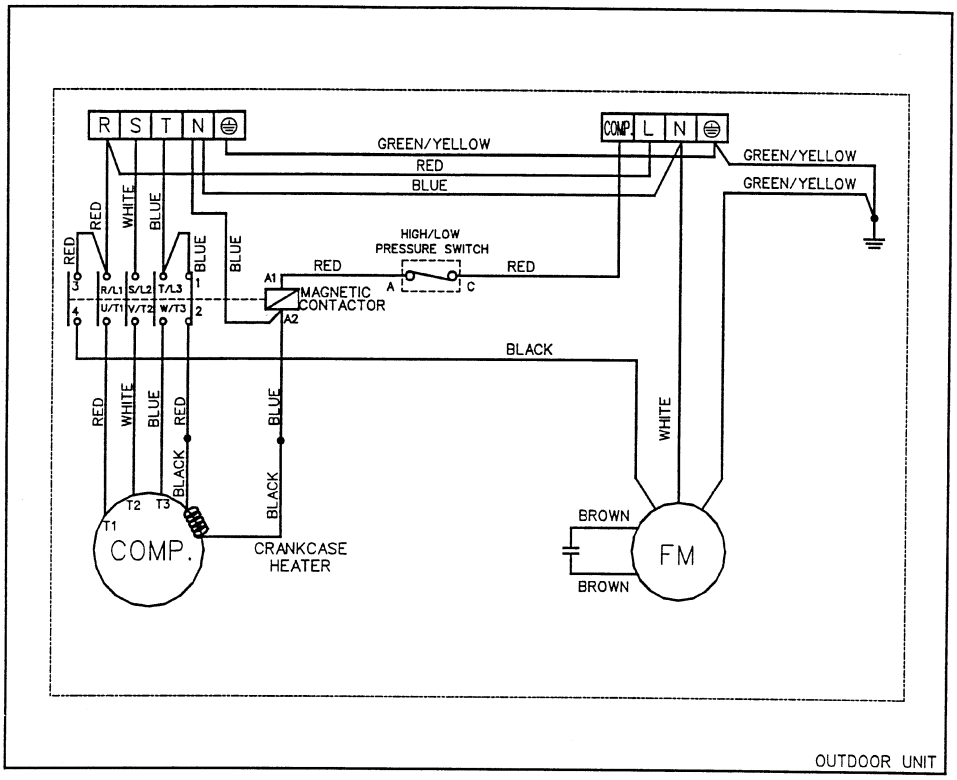
**Model : M4LC 030C**



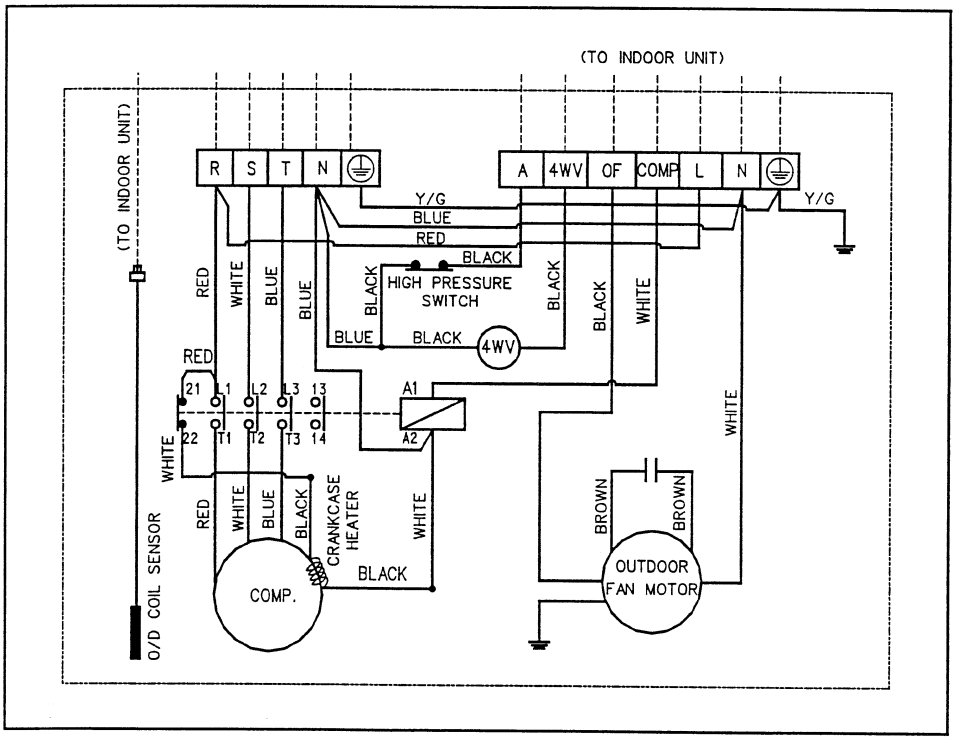

**Model : M4LC 030CR**



## Model : M4LC 040C/050C




## Model : M4LC 040CR/050CR



# Special precautions when dealing with refrigerant R407C unit

**1) What is new refrigerant R407C?**

R407C is a zeotropic refrigerant mixture which has zero ozone depletion potential and thus conformed to the Montreal Protocol regulation. It requires Polyol ester oil (POE) oil for its compressor's lubricant. Its refrigerant capacity and performance are about the same as the refrigerant R22.

**2) Components**

Mixture weight composition R32(23%), R125(25%), R134a(52%)

**3) Characteristic**

- R407C liquid and vapor components have different compositions when the fluid evaporates or condenses. Hence, when leak occurs and only vapor leaks out, the composition of the refrigerant mixture left in the system will change and subsequently affect the system performance. If just additional refrigerant is added to leaked system, system performance will dop. It is recommended that the system should be evacuated thoroughly before recharging with R407C.
- When refrigerant R407C is used, the composition will differ depending on whether it is in gaseous or liquid phase. Hence when charging R407C, ensure that only liquid is being withdrawn from the cylinder or can. This is to make certain that only original composition of R407C is being charged into the system.
- POE oil is used as lubricant for R407C compressor, which is different from the mineral oil used for R22 compressor. Extra precaution must be taken not to expose the R407C system too long to moist air.

**4) Check list before installation/servicing**

- Tubing
  Refrigerant R407C is more easily affected by dust of moisture compared with R22, make sure to temporarily cover the ends of the tubing prior to installation
- Compressor oil
  No additional charge of compressor oil is permitted.
- Refrigerant
  No other refrigerant other that R407C
- Tools
  Tools specifically for R407C only (must not be used for R22 or other refrigerant)
  i) Manifold gauge and charging hose
  ii) Gas leak detector
  iii) Refrigerant cylinder/charging cylinder
  iv) Vacuum pump c/w adapter
  v) Flare tools
  vi) Refrigerant recovery machine

**5) Handling and installation guidelines**

Like R22 system, the handling and installation of R407C system are closely similar. All precautionary measures; such as ensuring no moisture, no dirt or chips in the system, clean brazing using nitrogen, and thorough leak check and vacuuming are equally important requirements. However, due to zeotropic nature of R407C and its hydroscopic POE oil, additional precautions must be taken to ensure optimum and trouble-free system operation.

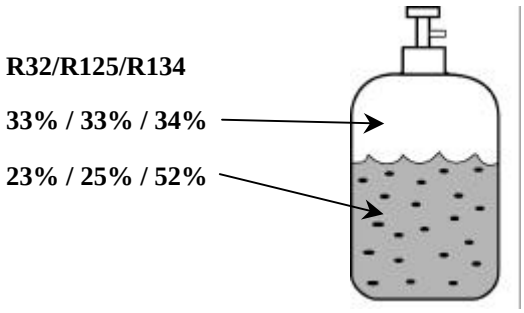
a) Filter-dryer must be installed along the liquid line for all R407C air conditioners. This is to minimise the contamination of moisture and dirt in the refrigerant system. Filter-dryer must be of molecular sieve type. For a heat-pump system, install a two-way flow filter dryer along the liquid line.

b) During installation or servicing, avoid prolong exposure of the internal part of the refrigerant system to moist air. Residual POE oil in the piping and components can absorb moisture from the air.

c) Ensure that the compressor is not expose to open air for more than the recommended time specified by its manufacturer (typically less than 10 minutes). Removed the seal-plugs only when the compressor is about to be brazed.

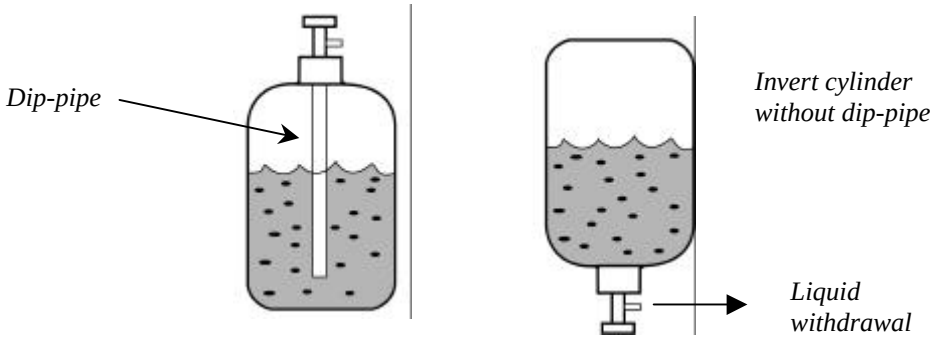
d) The system should be thoroughly vacuumed to 1.0 Pa (-700mmHg) or lower. This vacuuming level is more stringent than R22 system so as to ensure no incompressible gas and moisture in the system.

e) When charging R407C, ensure that only liquid is being withdrawn from the cylinder or can. This is to ensure that only the original composition of R407C is being delivered into the system. The liquid composition can be different from the vapor composition.




*Composition of R407C in vapor phase is different from liquid phase.*

f) Normally, the R407C cylinder or can is being equipped with a dip-pipe for liquid withdrawal. However, if the dip-pipe is not available, invert the cylinder or can so as to withdraw liquid from the valve at the bottom.




g) When servicing leak, the top-up method, commonly practiced for R22 system, is not recommended for R407C system. Unlike R22 where the refrigerant is of a single component, the composition of R407C, which made-up of three different components, may have changed during the leak. Consequently, a top-up may not ensure that the R407C in the system is of original composition. This composition shift may adversely affect the system performance. It is recommended that the system should be evacuated thoroughly before recharging with R407C.

# Installation

**Caution**

**Sharp edges and coil surface are potential injury hazard. Avoid from contact with them.**

## (1) Installation of indoor unit

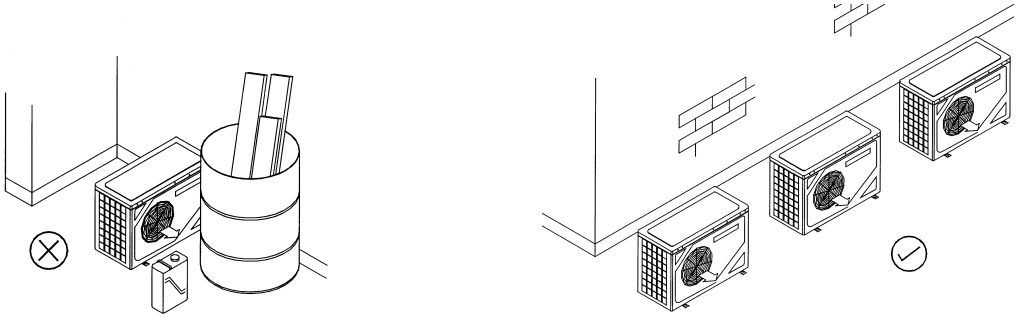
For installation of indoor unit, please refer to the indoor unit technical manual.

## (2) Installation of outdoor unit

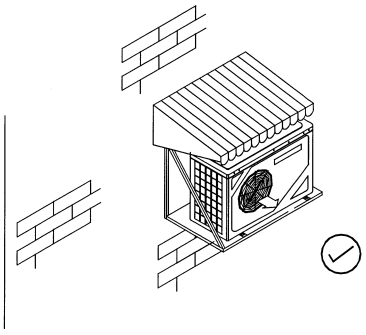
As condensing temperature rises, evaporating temperature rises and cooling capacity drops. In order to achieve maximum cooling capacity, the location selected for outdoor unit should fulfill the following requirements :-

- Install the condensing (outdoor) unit in a way such that hot air distributed by the outdoor condensing unit cannot be drawn in again (as in the case of short circuit of hot discharge air). Allow sufficient space for maintenance around the unit.

- Ensure that there is no obstruction of air flow into or out of the unit. Remove obstacles that block air intake or discharge.



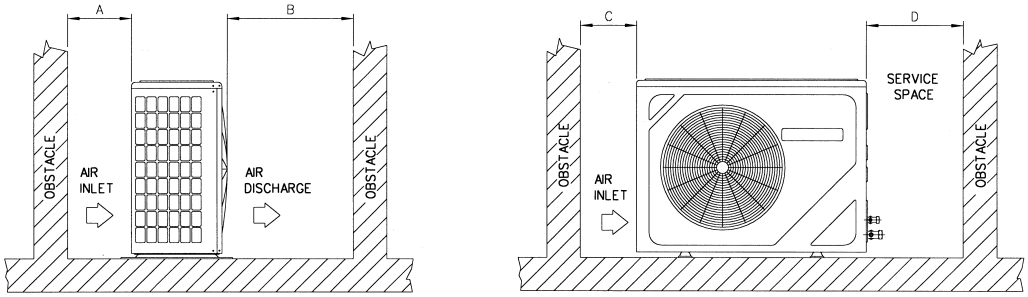
- The location must be well ventilated, so that the unit can draw in and distribute plenty of air thus lowering the condensing temperature.
- A place capable of bearing the weight of the outdoor unit and isolating noise and vibration.
- A place protected from direct sunlight. Otherwise use an awning for protection, if necessary.



- The location must not be susceptible to dust or oil mist.

## Installation clearance

- Outdoor units must be installed such that there is no short circuit of the hot discharge air or obstruction to smooth air flow. Select the coolest possible place where intake air should not be hotter than the outside temperature (max. 45°C)




| Minimum Distance | A | B | C | D |
|---|---|---|---|---|
| Series I | 150 mm | 1,000 mm | 150 mm | 500 mm |
| Series II | 300 mm | 1,000 mm | 300 mm | 500 mm |

## (3) Refrigerant piping

**! Caution**

**Must install a molecular-sieve type filter dryer along the liquid line.**

## Maximum pipe length and maximum number of bends

- When the pipe length becomes too long, both the capacity and reliability drop. As the number of bends increases, system piping resistance to the refrigerant flow increases. This will lower the cooling capacity and as a result, the compressor may become defective. Always choose the shortest path and follow the recommendation as tabulated below :

| MODELS / DATA | 10 | 15 | 20 | 25 | 30 | 40 | 50 |
|---|---|---|---|---|---|---|---|
| Max. Length (m) | 7 | 10 | 15 | 15 | 20 | 20 | 20 |
| Max. Elevation (m) | 5 | 5 | 8 | 8 | 10 | 10 | 10 |
| Max. No of Bends | 10 | 10 | 10 | 10 | 10 | 10 | 10 |

## Piping sizes (flare connection type)

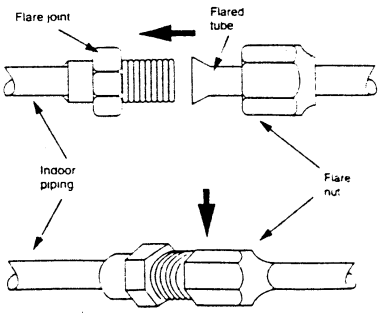
- Piping sizes are as follows :

| MODELS | 10 | 15 | 20 | 25 | 30 | 40 | 50 |
|---|---|---|---|---|---|---|---|
| Liquid (mm/in) | 6.35 (1/4) | 6.35 (1/4) | 6.35 (1/4) | 9.52 (3/8) | 9.52 (3/8) | 9.52 (3/8) | 9.52 (3/8) |
| Suction (mm/in) | 9.52 (3/8) | 12.70 (1/2) | 15.88 (5/8) | 15.88 (5/8) | 15.88 (5/8) | 19.05 (3/4) | 19.05 (3/4) |

**PIPING CONNECTION TO THE UNITS**

- Align the centre of the piping and sufficiently tighten the flare nut with fingers.
- Finally, tighten the flare nut with torque wrench until the wrench clicks.
- When tightening the flare nut with torque wrench, ensure the direction for tightening follows the arrow on the wrench.

| PIPE SIZE (mm/in) | TORQUE (Nm) |
|---|---|
| 6.35 (1/4) | 18 |
| 9.52 (3/8) | 42 |
| 12.70 (1/2) | 55 |
| 15.88 (5/8) | 65 |
| 19.05 (3/4) | 78 |



## (4) Wiring

**Electrical connections**

- Wiring regulations on wire diameters differ from country to country. Please refer to your LOCAL ELECTRICAL CODES for field wiring rules. Be sure that installation comply with such rules and regulations.

**General precautions**

- Ensure that the rated voltage of the unit corresponds to the name plate before carrying out proper wiring according to the wiring diagram.
- Provide a power outlet to be used exclusively for each unit. A power supply disconnect and a circuit breaker for over-current protection should be provided in the exclusive line.
- The unit must be GROUNDED to prevent possible hazards due to insulation failures.
- All wiring must be firmly connected.
- All wiring must not touch the hot refrigerant piping, compressor or any moving parts of fan motors.

## (5) Vacuuming and charging

- The pre-charged outdoor unit does not need any vacuuming or charging. However once it is connected, the connecting pipe line and the indoor need to be vacuumed before releasing R407C from the outdoor unit.
  1) Open the service port core cap.
  2) Connect pressure gauge to the service port.
  3) Connect the line to vacuum pump. Open the charging manifold valve and turn the pump on. Vacuum to -0. 1 MPa (-760mmHg) or lower. Evacuation time varies by the capacity of the pump but average time is approximately 1 hour.

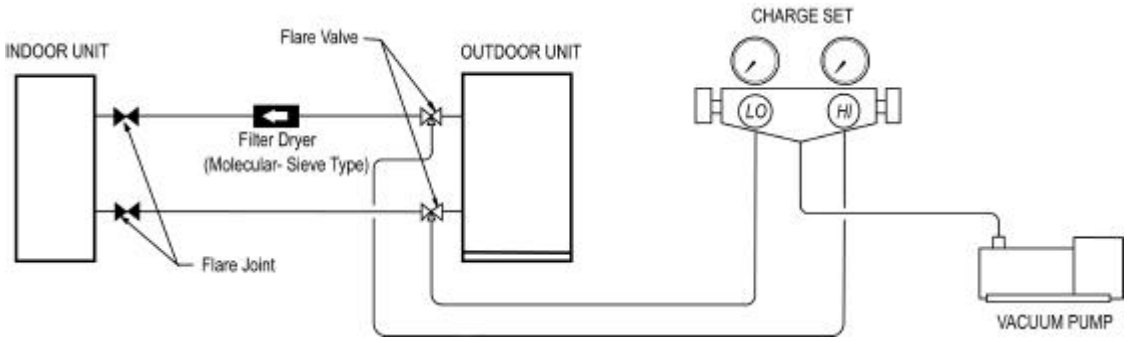



Diagram 1

4) After evacuation, unscrew the spindle (Diagram 2B) for the gas to run to indoor unit.

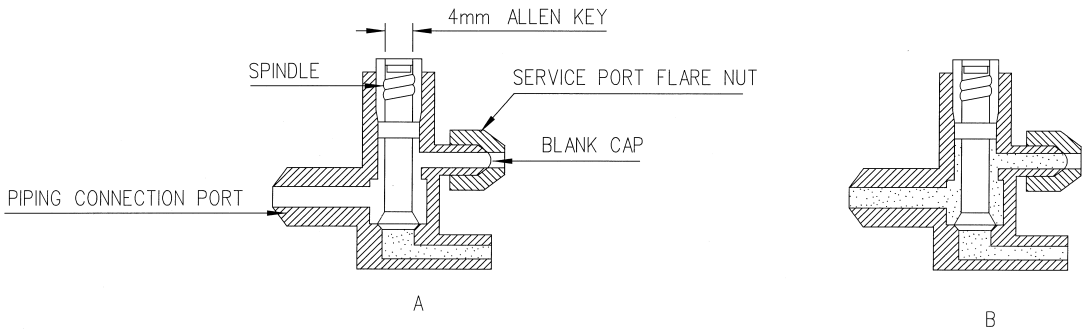
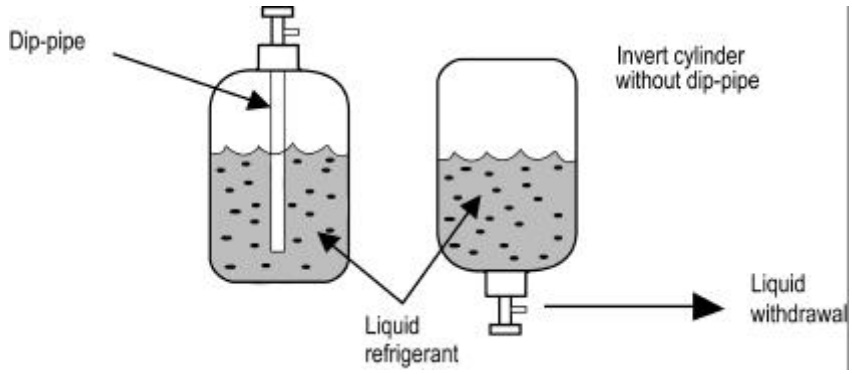



Diagram 2

**⚠ Caution**

**R407C must be charged as liquid. Usually R407C cylinder is equipped with a dip-pipe for liquid withdrawal. If there is no dip-pipe, the cylinder should be inverted so as to withdraw liquid R407C from the valve.**



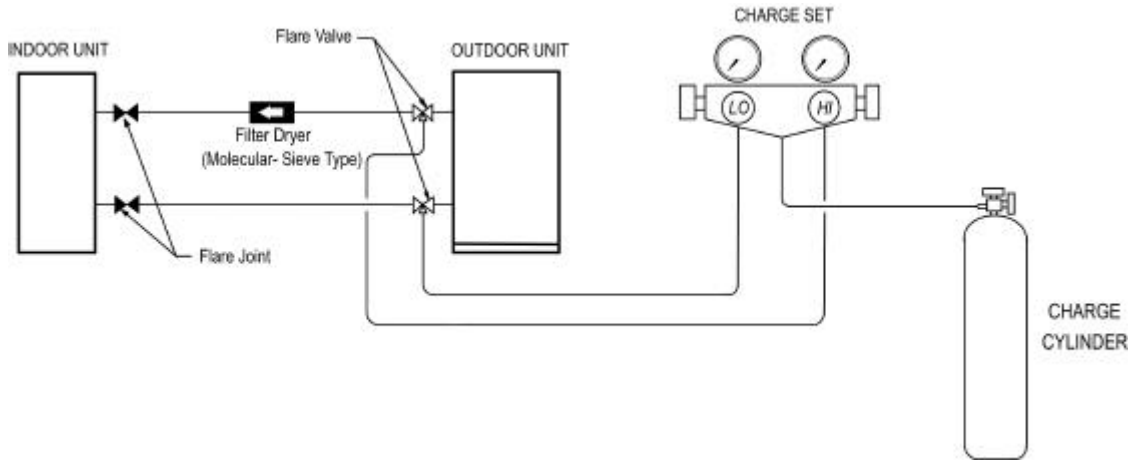

**⚠ Caution**

**Do not top-up when servicing leak, as this will reduce the unit performance. Vacuum the unit thoroughly and then charge the unit with fresh R407C according to the amount recommended in the specification.**

## (6) Additional charge

- The refrigerant gas has already been pre-charged into the outdoor unit. For the piping length of 5m and below, additional refrigerant charge after vacuuming is not necessary.
- When the piping length is more than 5m, please use the table below (unit in grams).

| MODEL | 7m | 10m | 15m | 20m |
|---|---|---|---|---|
| **10** | 40 | 100 | 200 | - |
| **15** | 40 | 100 | 200 | - |
| **20** | 40 | 100 | 200 | - |
| **25** | 80 | 200 | 400 | - |
| **30** | 90 | 225 | 450 | 675 |
| **40** | 90 | 225 | 450 | 675 |
| **50** | 90 | 225 | 450 | 675 |



**! Caution**

**Avoid prolong exposure of an opened compressor, or the internal part of refrigerant piping to moist air. The POE oil in the compressor and piping can absorb moisture from air.**

## (7) Overall checking

- Ensure the following, in particular :
  1) The unit is mounted solidly and rigid in position.
  2) Piping and connections are leak proof after charging.
  3) Proper wiring has been done.

- Drainage check - pour some water into drain pan.

- Test run
  1) Conduct a test run after water drainage test and gas leakage test.
  2) Watch out for the following :
     a) Is the electric plug firmly inserted into the socket?
     b) Is there any abnormal sound from unit?
     c) Is there any abnormal vibrations with regard to unit itself or piping?
     d) Is there smooth drainage of water?

- Check that :
  1) Condenser fan is running, with warm air blowing off the condensing unit.
  2) Evaporator blower is running and discharge cool air.
  3) Suction (low side) pressure as recommended.
  4) The remote controller incorporate a 3 minute delay in the circuit. Thus, it requires about 3 minutes before the condensing unit can start up.

## (8) Standard operating condition

COOLING ONLY UNIT

| **Temperature** | **Ts °C** | **Th °C** |
|---|---|---|
| Minimum indoor temperature | 19.4 | 13.9 |
| Maximum indoor temperature | 26.7 | 19.4 |
| Minimum outdoor temperature | 19.4 | 13.9 |
| Maximum outdoor temperature | 46.0 | 24.0 |

HEAT PUMP UNIT

| **Temperature** | **Ts °C** | **Th °C** |
|---|---|---|
| Minimum indoor temperature | 10.0 | - |
| Maximum indoor temperature | 26.7 | - |
| Minimum outdoor temperature | -8.0 | -9.0 |
| Maximum outdoor temperature | 24.0 | 18.0 |

Ts : Dry bulb temperature
Th : Wet bulb temperature

# Servicing And Maintenance

**⚠ Caution**

**Disconnect from Main Supply before Servicing the air conditioner**

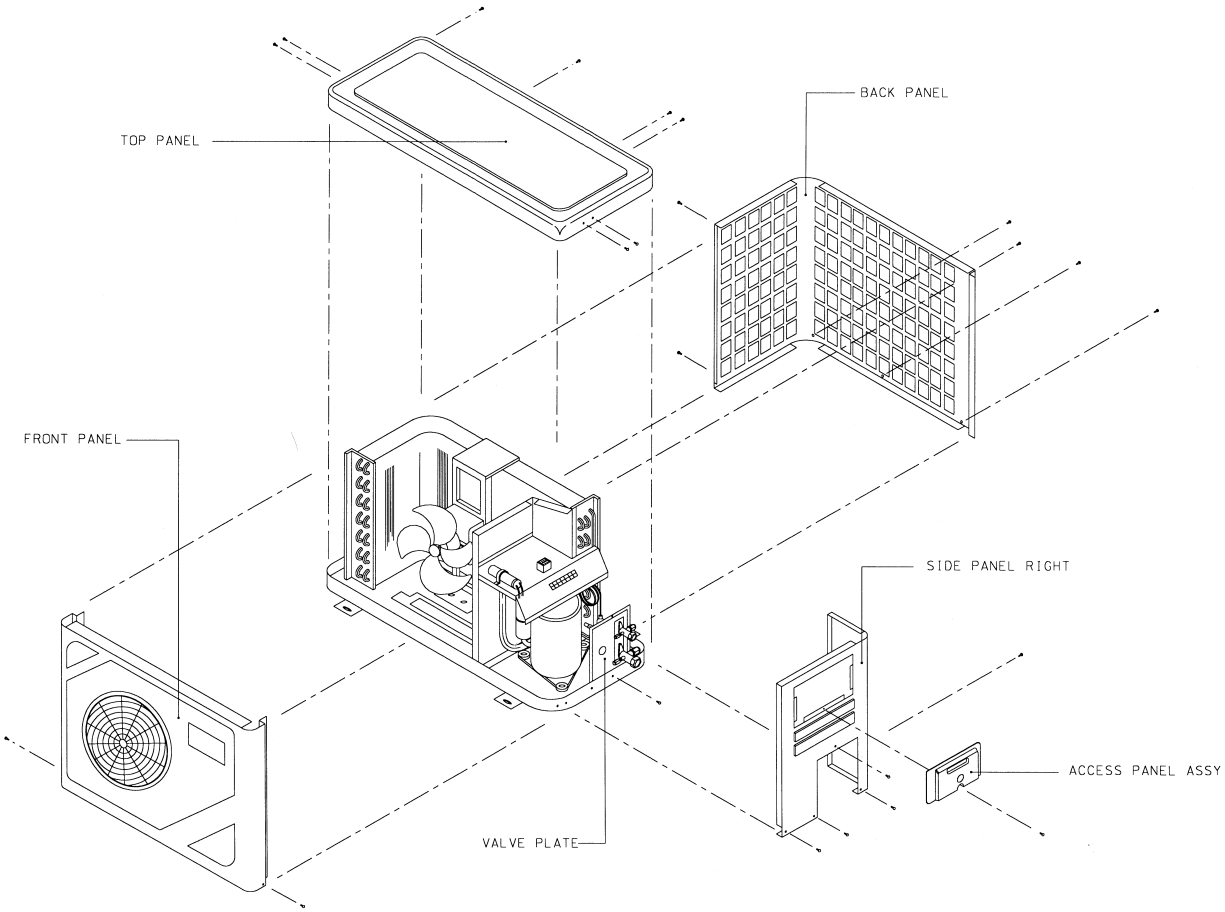
The unit is designed to give a long life operation with minimum maintenance required. However, it should be regularly checked and the following items should be given due attention.

| Components | Maintenance Procedure | Recommended Schedule |
|---|---|---|
| Air Filters<br>(Indoor unit) | 1. Clean with a vacuum cleaner, or by tapping lightly on any hard surface and then washing in lukewarm water (below 40°C) With neutral soap.<br>2. Rinse well to dry before re-installing.<br>3. Note : Never use petrol, thinner, benzene or any other chemicals. | Every 2 weeks.<br>More frequently if required. |
| Indoor Unit | 1. Clean away dirt or dust on grille or panel by wiping with a soft cloth soaked in lukewarm (or cold) water or neutral detergent solution.<br>2. Note: Never use petrol, thinner, benzene or any other volatile chemicals, which may cause plastic surface to deform. | Every 2 weeks.<br>More frequently if required. |
| Condensate Drain<br>Pan & Pipe | 1. Check and clean. | Every 3 months. |
| Indoor Fan | 2. Check for unusual noise. | As necessary. |
| Indoor/Outdoor Coil | 1. Check and remove dirt which are clogged between fins.<br>2. Check and remove obstacles which hinder air flow in and out of indoor/outdoor unit. | Every month.<br>Every month. |
| Electrical | 1. Check voltage, current and wiring.<br>2. Check faulty contacts caused by loose connections, foreign matters, etc. | Every 2 months.<br>Every 2 months. |
| Compressor | 1. No maintenance needed if refrigerant circuit remains sealed. However, check for refrigerant leak at joints & fittings. | Every 6 months. |
| Compressor Lubrication | 1. Oil is factory charged. Not necessary to add oil if circuit remains sealed. | No maintenance required. |
| Fan Motors Lubrication | 1. All motors pre-lubricated and sealed at factory. | No maintenance required. |

## Pre-start up maintenance (after extended shutdown)

- Inspect thoroughly and clean indoor and outdoor units.
- Clean or replace air filters.
- Clean condensate drain line.
- Clean clogged indoor and outdoor coils.
- Check fan imbalance before operation.
- Tighten all wiring connections and panels.
- Check for refrigerant leakage

The design of the outdoor series allows servicing to be carried out readily and easily. The removal of the top side, front and back panel make almost every part accessible.




**CAUTION!**

Do not charge OXYGEN, ACETYLENE OR OTHER FLAMMABLE and poisonous gases into the unit when performing a leakage test or an airtight test. These gases could cause severe explosion and damage if expose to high temperature and pressure.

It is recommended that only nitrogen or refrigerant be charged when performing the leakage or airtight test.

# Troubleshooting

When any air-conditioner malfunction is noted, immediately switch off the power supply to the unit, and contact the local dealer, if necessary. Some simple troubleshooting tips are given below :

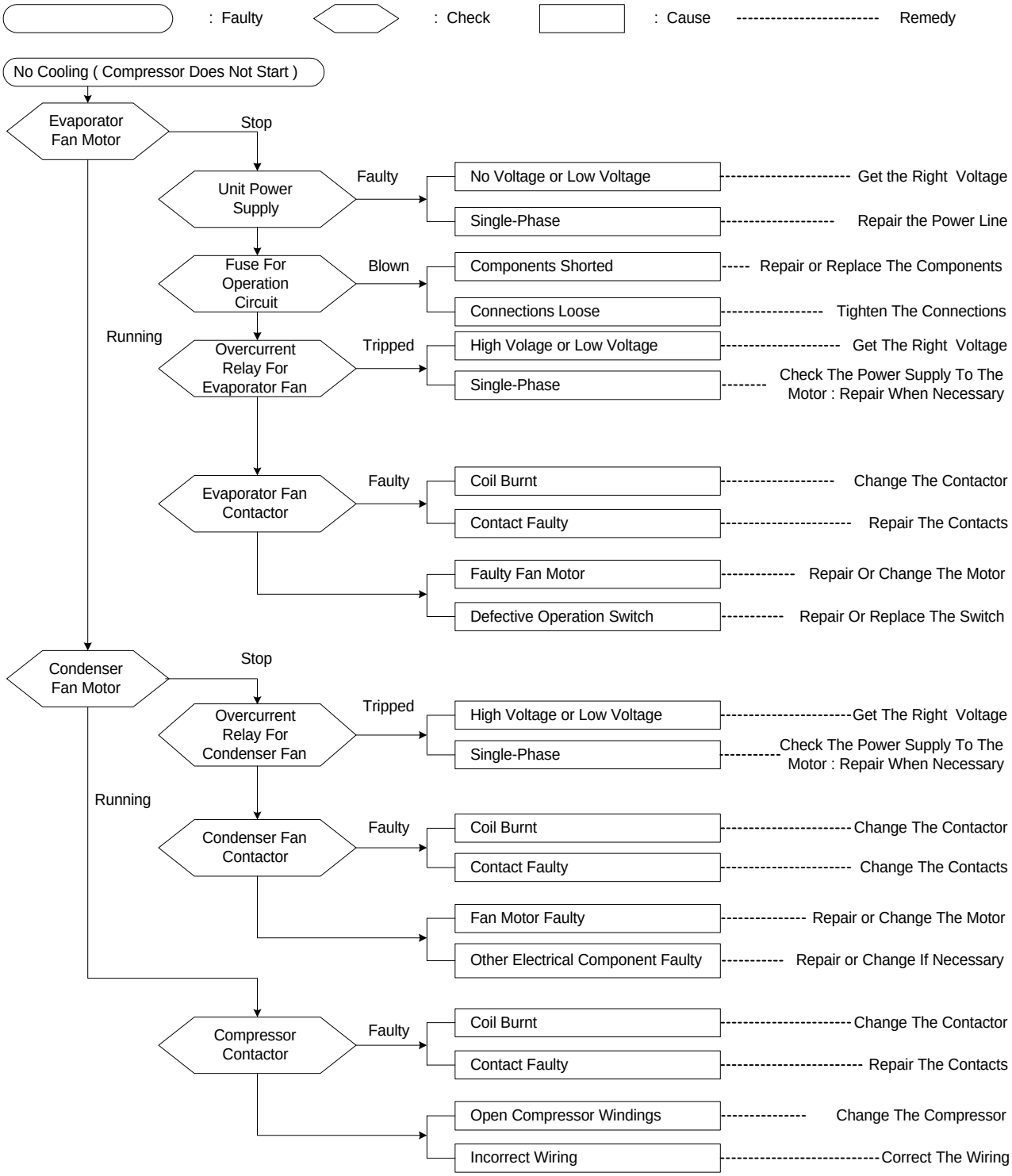
| Fault | Cause |
|---|---|
| 1. Fan does not work 3 minutes after starting | • Protection against the frequent starting. Wait 3 or 4 minutes. |
| 2. The air conditioning unit does not work | • Power failure or you must be replaced the fuse.<br>• The power plug is disconnected.<br>• Possibility of making a programming error in the controller.<br>• If the fault persist after these verifications, contact your installer. |
| 3. The air conditioning unit does not blow sufficiently | • The air filter is dirty.<br>• The doors or windows are open.<br>• The air entrance and exit are clogged.<br>• The regulate temperature is not high enough. |
| 4. The remote control light is deficient | • The batteries are discharge.<br>• The batteries are not correctly inserted.<br>• The assembly is not good. |
| 5. Air discharge flow has a bad odor | • This odor can be caused by cigarette smoke particles, perfume, sweat, which stick to the coil.<br>• Check if there is any moisture on the walls, garment, other.<br>• Check the drain pan. |
| 6. Condensation on the air grille of indoor unit | • This is due to air humidity after a long time of operation.<br>• The unit has a lower temperature point, increase the point and operate at high speed. |
| 7. The water flow of air conditioning unit | • Check the condensate evacuation. |
| 8. The air conditioning unit are noisy | • <<Air flow noise>> : refrigerant fluid admission in evaporator. |

## For cooling only models or heat pump models (cooling cycle)

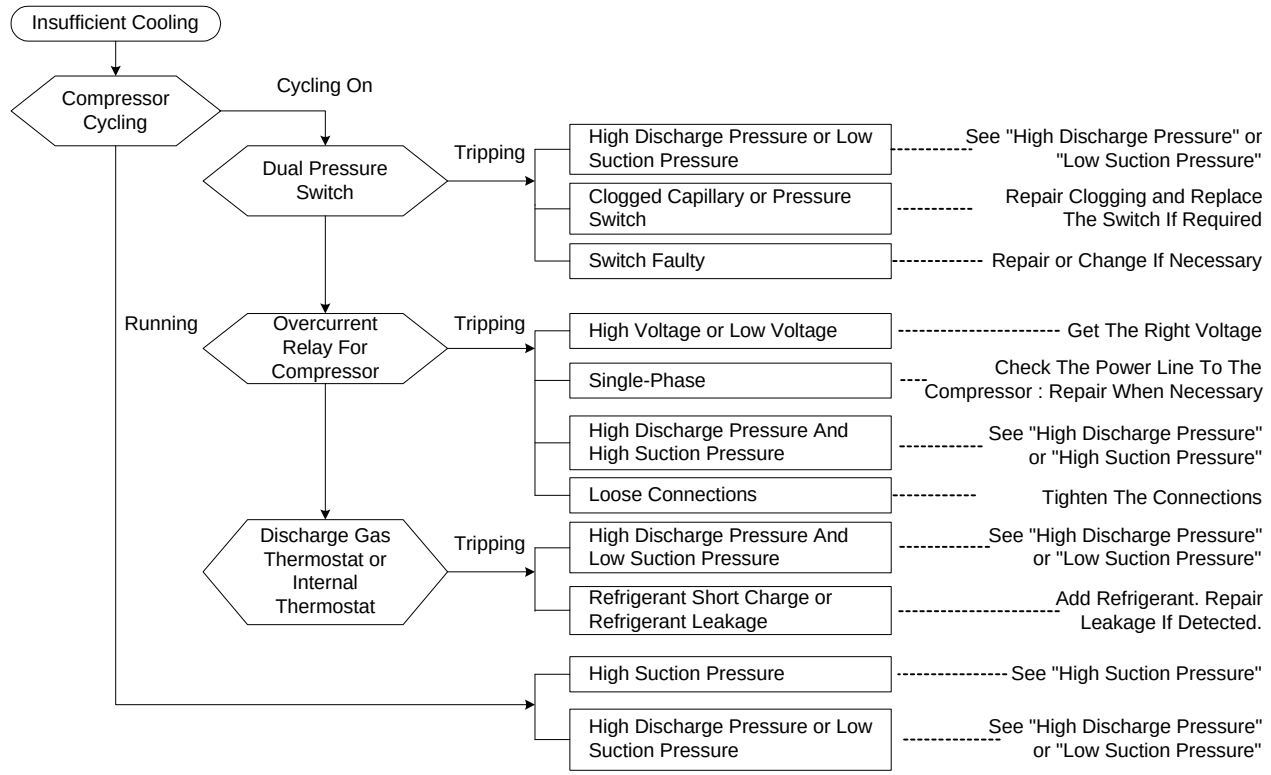
## Diagnosis by flow chart

The following chart are efficient checking procedures for troubleshooting when these fan-coil units, are coupled with the condensing units using standard wiring. For dual circuited models, perform the procedures for each circuit.

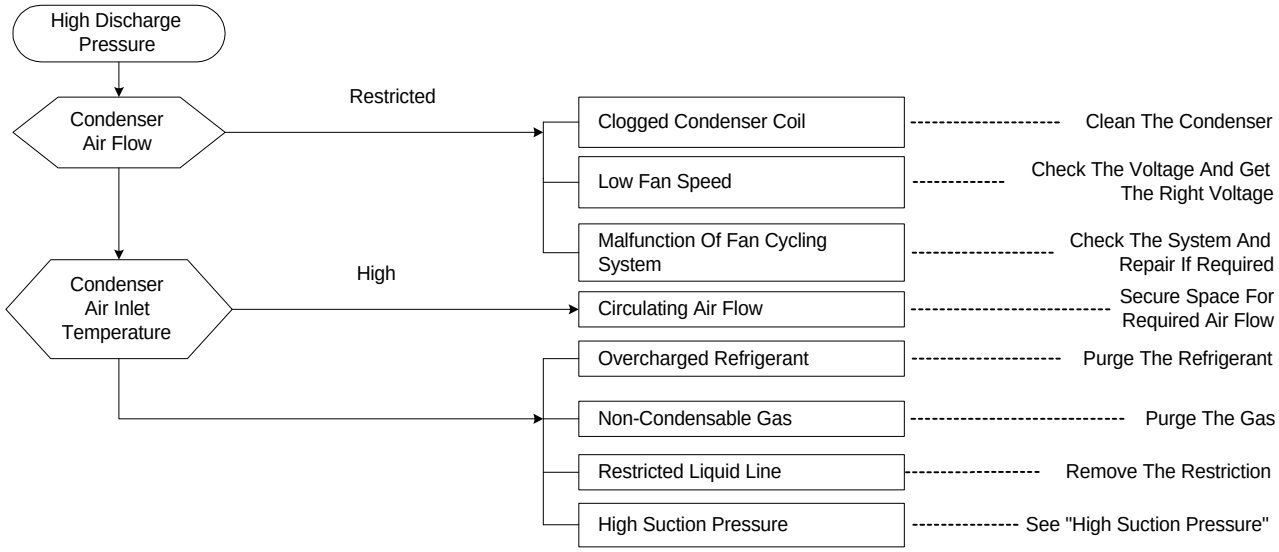
## No Cooling



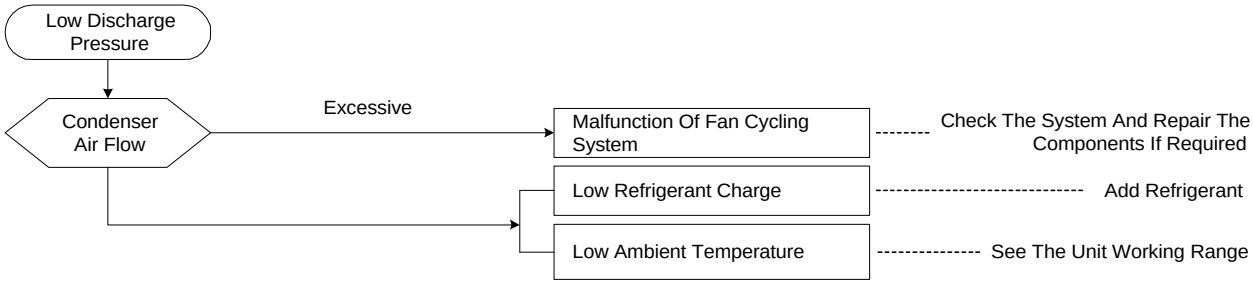
## Insufficient Cooling


Insufficient Cooling
Compressor Cycling
Cycling On
Dual Pressure Switch
Tripping
High Discharge Pressure or Low Suction Pressure
See "High Discharge Pressure" or "Low Suction Pressure"
Clogged Capillary or Pressure Switch
Repair Clogging and Replace The Switch If Required
Switch Faulty
Repair or Change If Necessary
Running
Overcurrent Relay For Compressor
Tripping
High Voltage or Low Voltage
Get The Right Voltage
Single-Phase
Check The Power Line To The Compressor : Repair When Necessary
High Discharge Pressure And High Suction Pressure
See "High Discharge Pressure" or "High Suction Pressure"
Loose Connections
Tighten The Connections
Discharge Gas Thermostat or Internal Thermostat
Tripping
High Discharge Pressure And Low Suction Pressure
See "High Discharge Pressure" or "Low Suction Pressure"
Refrigerant Short Charge or Refrigerant Leakage
Add Refrigerant. Repair Leakage If Detected.
High Suction Pressure
See "High Suction Pressure"
High Discharge Pressure or Low Suction Pressure
See "High Discharge Pressure" or "Low Suction Pressure"

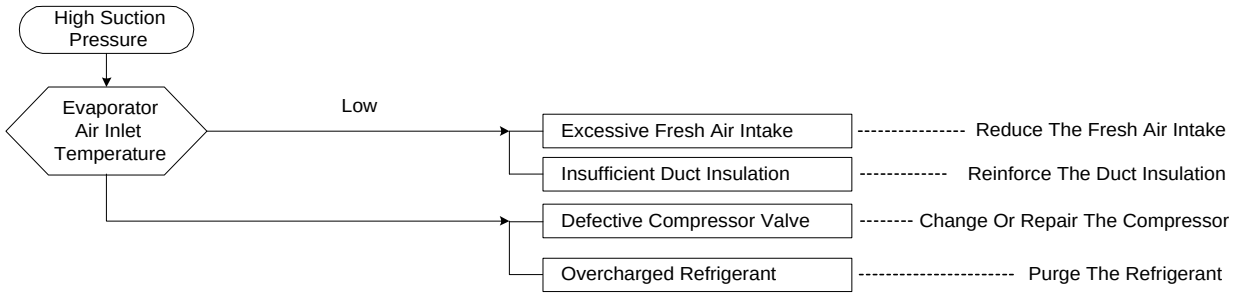
## High Discharge Pressure



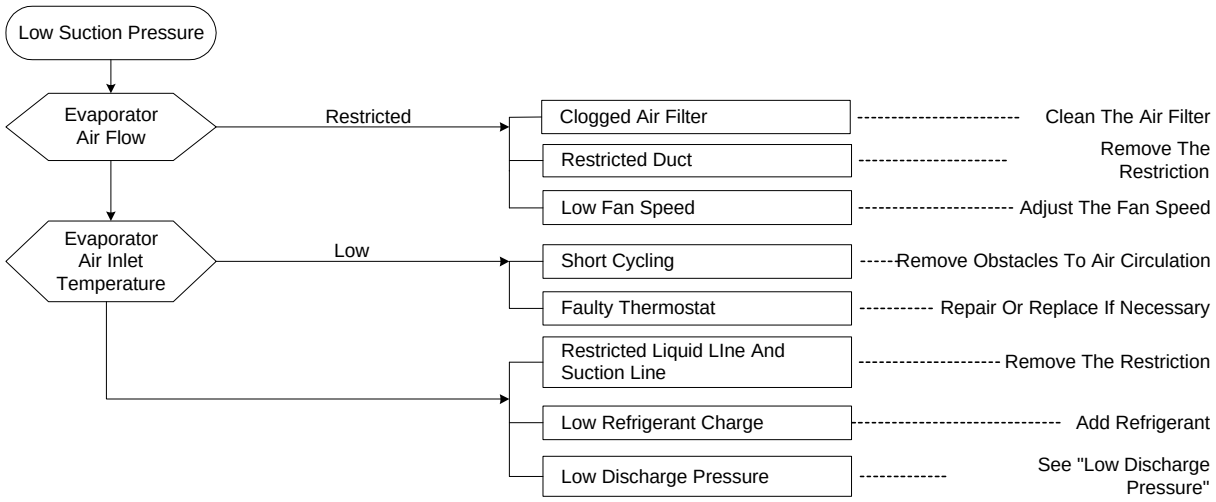

## Low Discharge Pressure



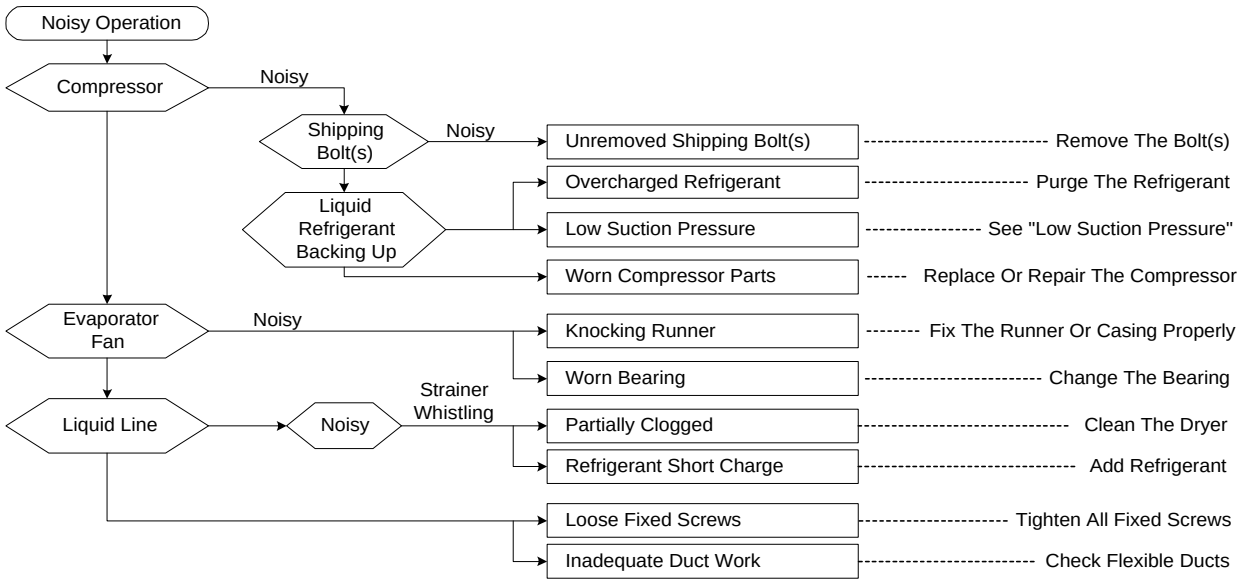
## High Suction Pressure




## Low Suction Pressure




## Noisy Operation



## For Heat Pump Models

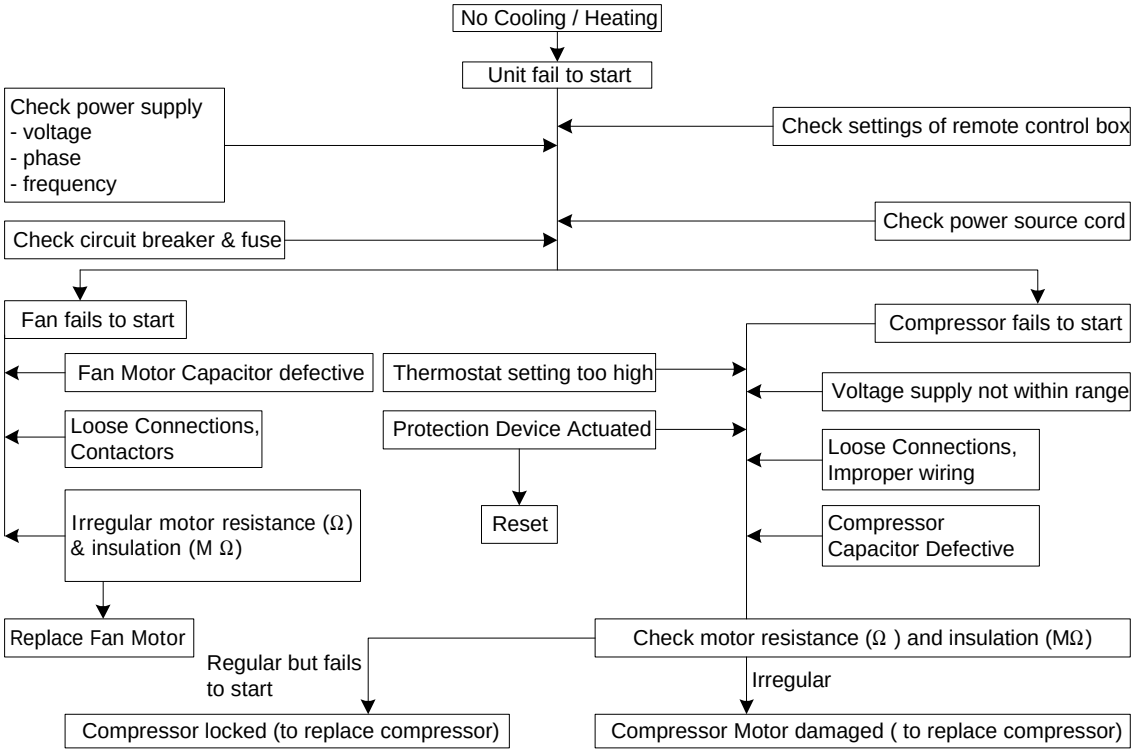
## By means of pressure readings :

| Pressure | | | | | | Probable Cause |
|---|---|---|---|---|---|---|
| Data / Circuit | Too Low | A Little Low | Normal | A Little High | Too High | |
| High Side<br>Low Side | | | | | ●<br>● | 1. Overcharged with refrigerant.<br>2. Non-condensable gases in refrigerant circuit (e.g. oil).<br>3. Obstructed air-intake/discharge.<br>4. Short circuiting of hot air outdoor unit. |
| High Side<br>Low Side | ●<br> | | | | <br>● | 1. Poor compression/no compression (compressor defective.)<br>2. Check valve stick in open position.<br>3. Reversing valve leaking. |
| High Side<br>Low Side | <br>● | ●<br> | | | | 1. Undercharged with refrigerant.<br>2. Refrigerant leakage.<br>3. Air filter clogged/dirty (indoor unit).<br>4. Indoor fan locked.(cooling)<br>5. Defective defrost control, outdoor coil freezed up (heating).<br>6. Outdoor fan locked (heating). |
| High Side<br>Low Side | | | | <br>● | ●<br> | 1. Outdoor fan blocked (cooling).<br>2. Outdoor coil dirty (cooling).<br>3. Indoor fan locked (heating).<br>4. Indoor filter clogged/dirty (heating).<br>5. Non-condensable gases in refrigerant circuit (e.g. air) |
| High Side<br>Low Side | | | | ●<br> | <br>● | 1. Air intake temperature of indoor unit too high. |

## By means of diagnosis flow chart

Generally, there are two kinds of problems, i.e. starting failure and insufficient cooling/heating. "Starting Failure" is caused by electrical defect while "Insufficient Cooling/Heating" is caused by improper application or defects in refrigerant circuit.

### i) Diagnosis of Electric Circuit

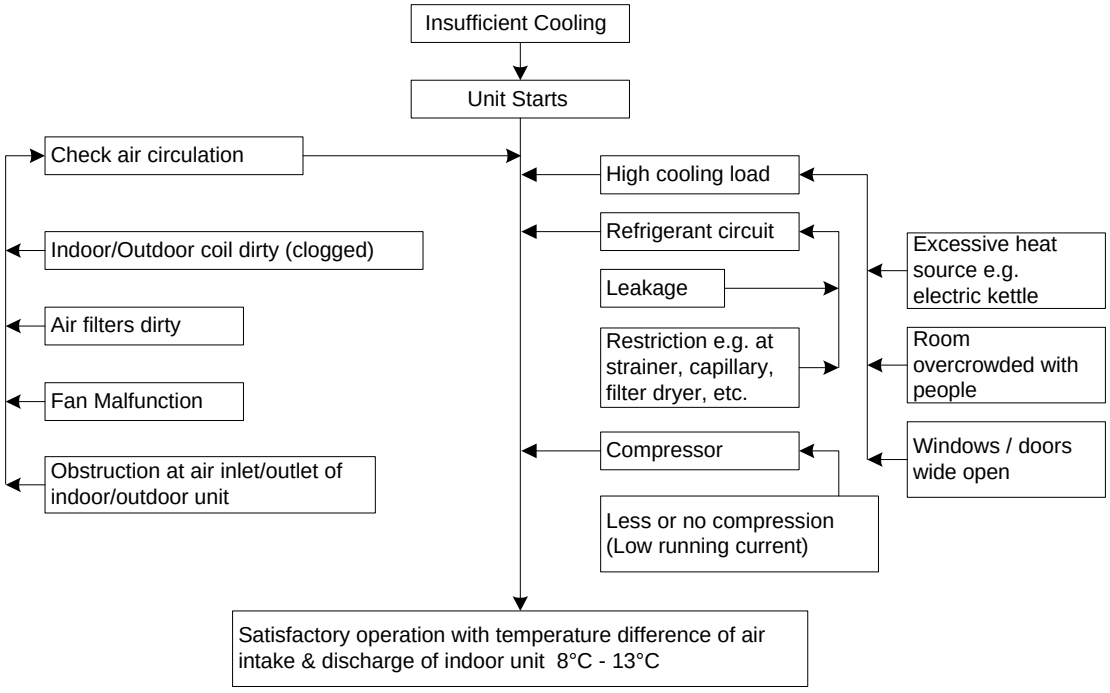


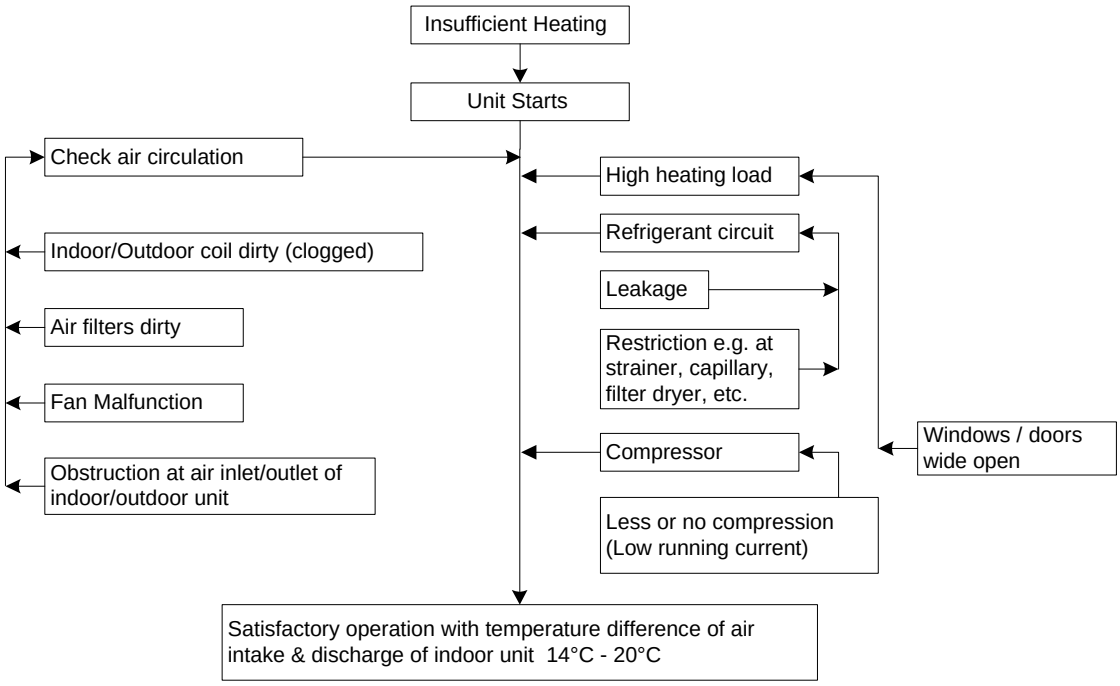
The most common causes of air conditioner failure to “start" are:-

a) Voltage not within ±10% of rated voltage.
b) Power supply interrupted.
c) Control settings improper.
d) Air conditioner is disconnected from main power source.
e) Fuse blown or circuit breaker off.

## II) Diagnosis of refrigerant circuit / application

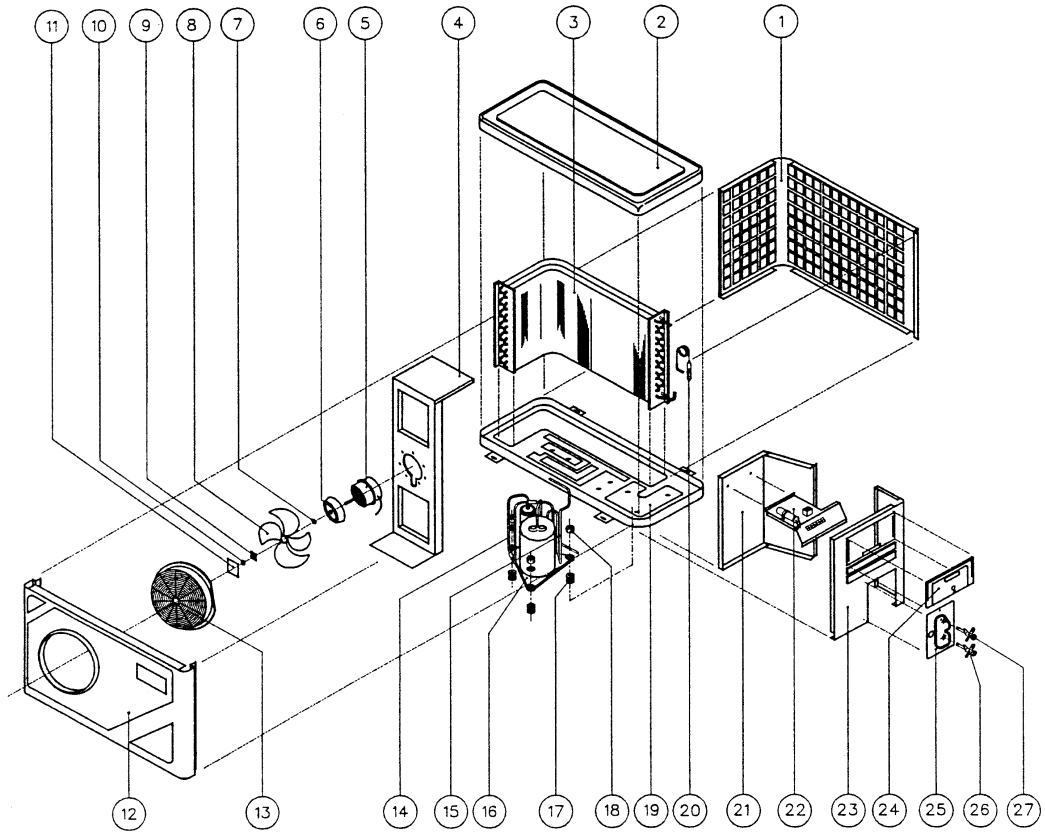
There might be some cases where the unit starts running but does not perform satisfactory, i.e. insufficient cooling. Judgment could be made by measuring temperature difference of indoor unit's intake and discharge air as well as running current.


Insufficient Cooling
Unit Starts
Check air circulation
Indoor/Outdoor coil dirty (clogged)
Air filters dirty
Fan Malfunction
Obstruction at air inlet/outlet of indoor/outdoor unit
High cooling load
Refrigerant circuit
Leakage
Restriction e.g. at strainer, capillary, filter dryer, etc.
Compressor
Less or no compression (Low running current)
Excessive heat source e.g. electric kettle
Room overcrowded with people
Windows / doors wide open
Satisfactory operation with temperature difference of air intake & discharge of indoor unit 8°C - 13°C


Insufficient Heating
Unit Starts
Check air circulation
Indoor/Outdoor coil dirty (clogged)
Air filters dirty
Fan Malfunction
Obstruction at air inlet/outlet of indoor/outdoor unit
High heating load
Refrigerant circuit
Leakage
Restriction e.g. at strainer, capillary, filter dryer, etc.
Compressor
Less or no compression (Low running current)
Windows / doors wide open
Satisfactory operation with temperature difference of air intake & discharge of indoor unit 14°C - 20°C

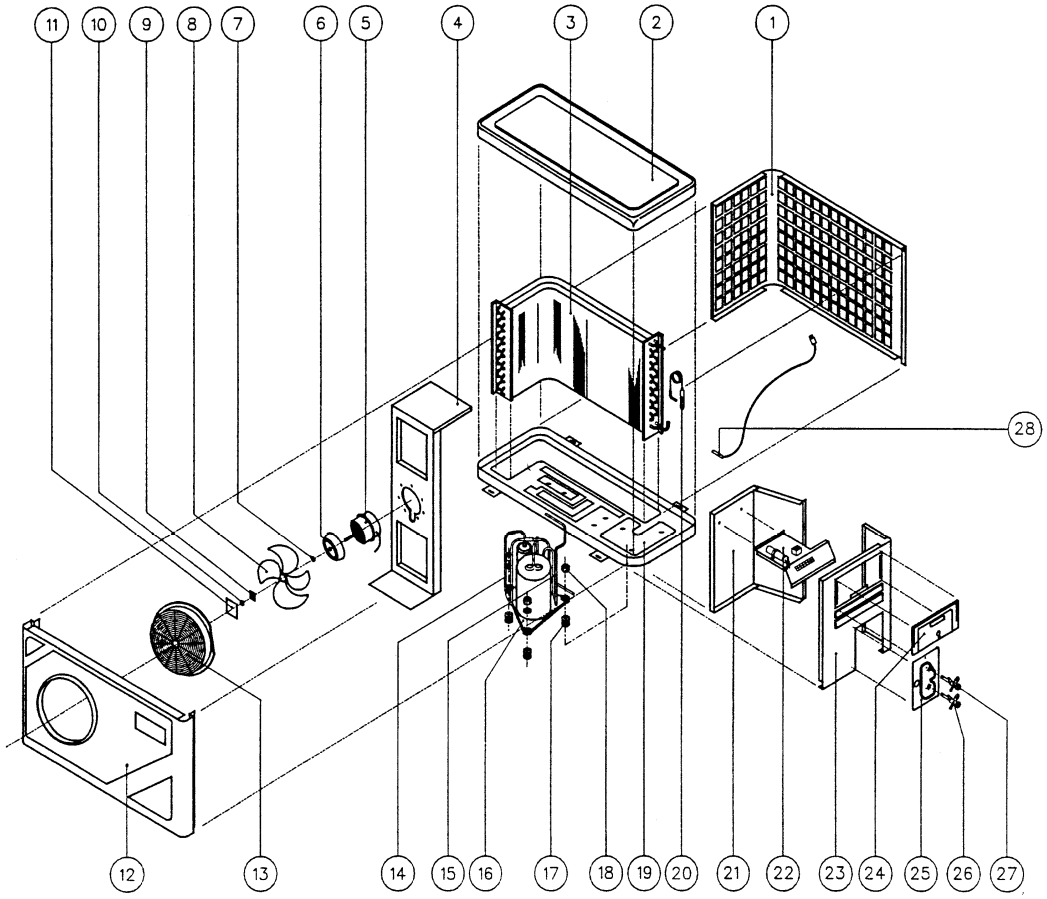
# Parts List

**Model : M4LC 010B/015B/020B/025B**



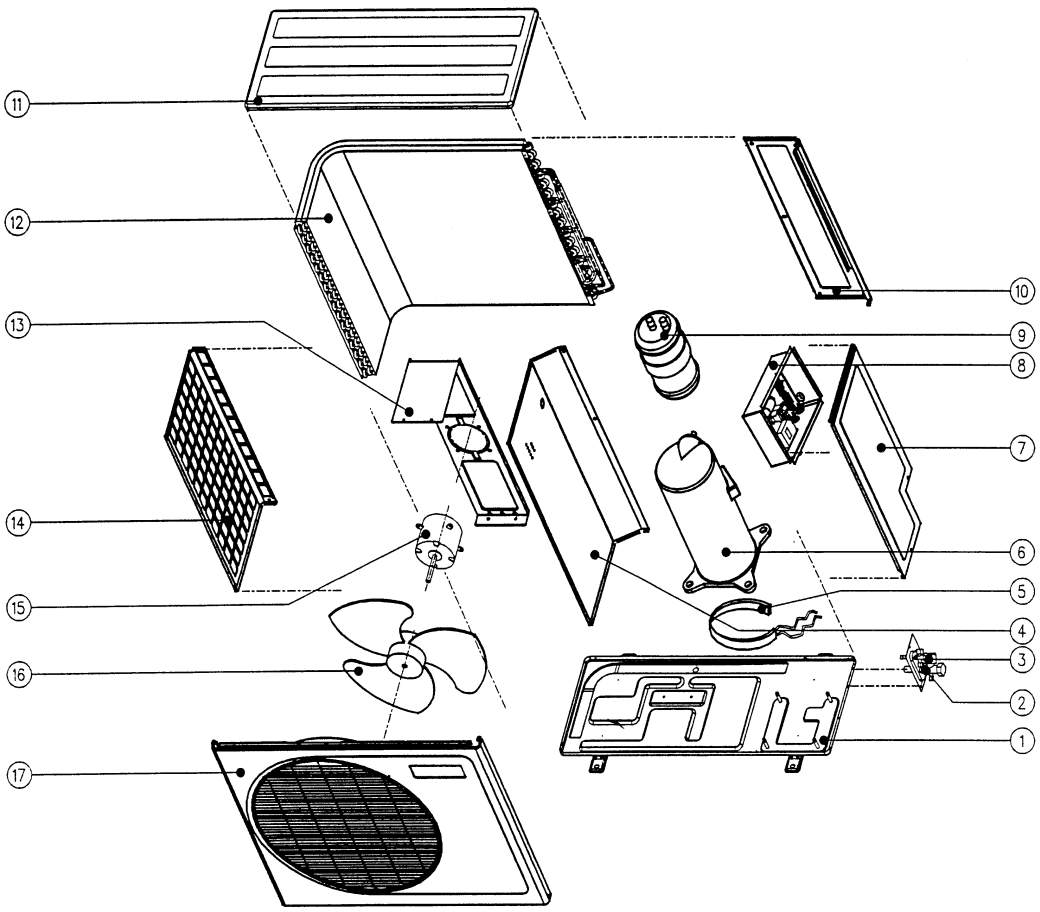

| | |
|---|---|
| 1. BACK PANEL | 16. ROTARY COMPRESSOR |
| 2. TOP PANEL | 17. RUBBER GROMMET |
| 3. CONDENSER COIL ASSY. | 18. COMPRESSOR NUT |
| 4. FAN MOTOR BRACKET | 19. BASE PAN ASSY. |
| 5. FAN MOTOR | 20. CAPILLARY TUBE ASSY. |
| 6. FLINGER | 21. PARTITION |
| 7. RING WASHER | 22. TERMINAL BOX PANEL ASSY. |
| 8. FAN BLADE | 23. SIDE PANEL |
| 9. SQUARE WASHER | 24. ACCESS PANEL |
| 10. HEX NUT | 25. FLARE VALVE MOUNTING PLATE |
| 11. BLACK LABEL | 26. SUCTION VALVE (5/8”) |
| 12. FRONT PANEL | 27. LIQUID VALVE |
| 13. OUTER NOZZLE | |
| 14. SUCTION PIPE ASSY. | |
| 15. DISCHARGE PIPE ASSY. | |

**Model : M4LC 010BR/015BR/020BR/025BR**



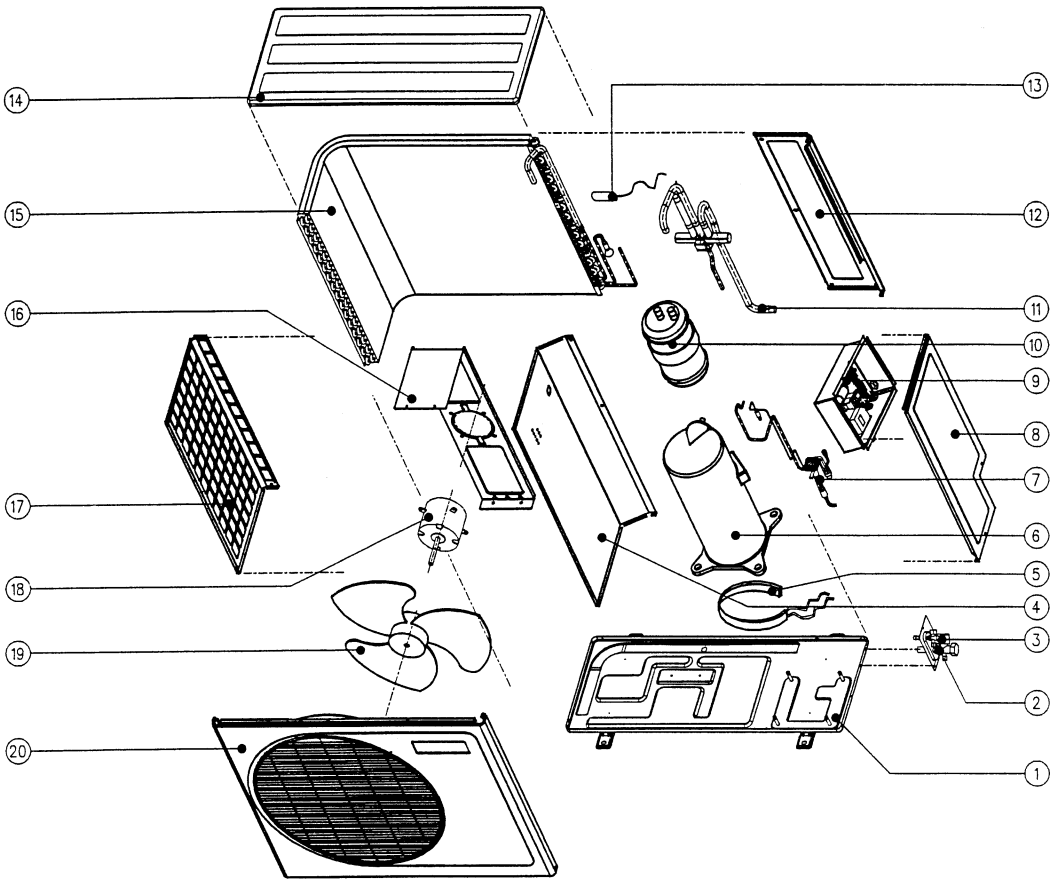

| | |
|---|---|
| 1. BACK PANEL | 16. ROTARY COMPRESSOR |
| 2. TOP PANEL | 17. RUBBER GROMMET |
| 3. CONDENSER COIL ASSY. | 18. COMPRESSOR NUT |
| 4. FAN MOTOR BRACKET | 19. BASE PAN ASSY. |
| 5. FAN MOTOR | 20. CAPILLARY TUBE ASSY. |
| 6. FLINGER | 21. PARTITION |
| 7. RING WASHER | 22. TERMINAL BOX PANEL ASSY. |
| 8. FAN BLADE | 23. SIDE PANEL |
| 9. SQUARE WASHER | 24. ACCESS PANEL |
| 10. HEX NUT | 25. FLARE VALVE MOUNTING PLATE |
| 11. BLACK LABEL | 26. SUCTION VALVE (5/8”) |
| 12. FRONT PANEL | 27. LIQUID VALVE |
| 13. OUTER NOZZLE | 28. DEFROST SENSOR AND CLIP |
| 14. 4-WAY VALVE ASSY. | |
| 15. DISCHARGE PIPE ASSY. | |

**Model : M4LC 030C/040C/050C**




| | |
|---|---|
| 1. ASSY. BASE PAN | 10. BACK RIGHT PANEL |
| 2. SUCTION VALVE | 11. TOP PANEL |
| 3. LIQUID VALVE | 12. CONDENSER COIL ASSY. |
| 4. PARTITION PANEL | 13. MOTOR BRACKET |
| 5. CRANKCASE HEATER | 14. SIDE LEFT PANEL |
| 6. COMPRESSOR ASSY. | 15. FAN MOTOR ASSY. |
| 7. SERVICE PANEL | 16. FAN BLADE |
| 8. TERMINAL BOARD MAIN ASSY. | 17. FRONT PANEL ASSY. |
| 9. ACCUMULATOR | |

**Model : M4LC 030CR/040CR/050CR**




| | |
|---|---|
| 1. ASSY. BASE PAN | 11. 4 WAY VALVE ASSY. |
| 2. SUCTION VALVE | 12. BACK RIGHT PANEL |
| 3. LIQUID VALVE | 13. DEFROST SENSOR AND CLIP |
| 4. PARTITION PANEL | 14. TOP PANEL |
| 5. CRANKCASE HEATER | 15. CONDENSER COIL ASSY. |
| 6. COMPRESSOR ASSY. | 16. MOTOR BRACKET |
| 7. TXV ASSY. | 17. SIDE LEFT PANEL |
| 8. SERVICE PANEL | 18. FAN MOTOR ASSY. |
| 9. TERMINAL BOARD MAIN ASSY. | 19. FAN BLADE |
| 10. ACCUMULATOR | 20. FRONT PANEL ASSY. |

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